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PROGRESS IN ELECTRIFICATION OF STEAM RAILROADS.

The completion this week of the electrification of the suburban service on the main line of the Pennsylvania Railroad, between Philadelphia and Paoli, marks another step of progress in the electrification of steam railroads. The present year has also seen the inauguration of service upon the electrified division of the Norfolk and Western Railway. In both of these cases electrification was turned to as the best solution of problems arising in the handling of traffic where it had become congested and where, if this expedient had not been resorted to, additional trackage facilities would be necessary to handle the business which is available.

There is a lesson in these developments which should not be permitted to escape attention. Electrical operation is frequently advocated on the ground of lessened operating costs, and this claim is not only justified, but has been repeatedly proven in actual experience. When fixed charges on the capital investment required, however, are included in the comparison, the showing for electrical equipment does not appear nearly so favorable. But here, as in many other cases of electrical applications, cost is not the only consideration, and frequently it is only a minor one. Facility in handling traffic and increase in the volume of traffic which can be handled, are important matters frequently met in the growth of a railroad business, and these are points where electrification shows up to great advantage. In city terminals of railroads there are still other considerations which weigh largely with the public, as to both financial and civic considerations, in addition to the direct effect upon the operating company. The smoke nuisance has been shown to cost the inhabitants of many of our large cities millions of dollars directly, and its relation to health and esthetic considerations is not to be neglected. A decision as to electrification, consequently, should not in such cases depend entirely upon the financial advantage of the operating railroad; nor upon questions of operating expediency.

This is a large element in the question which was entirely overlooked and neglected in the otherwise excellent discussion of this subject which took place this week at a meeting of the Western Society of Engineers in Chicago, and reported in this issue. There was general agreement by the speakers at this meeting that a decision for or against electrification must be reached from the standpoint alone of the

economics involved, but while this attitude is correct as far as it goes, it fails to consider the broad questions of public policy which are involved, and which must receive consideration in all matters having such a close relation to the general public welfare. It will, consequently, not do for a railroad to decide against electrification upon the plea that it will not be to its financial advantage. Such a narrow viewpoint would also exclude the use of all-steel cars, many safety devices, and other items of equipment which have tended to increase the cost of railroad operation, and especially of passenger traffic, in recent years. Many such things are demanded for the public good, regardless of expense, and must be supplied even though involving an increase in rates to meet the cost.

The public has an interest in electrification on account of the elements of health, cleanliness, noise, etc., involved, and these, as well as the purely economic elements, must receive due consideration in considering any proposal for electrification.

PUBLIC SERVICE.

On other pages of this issue it is our privilege and pleasure to publish quite fully the contents of a letter written by Mr. Theodore N. Vail, president of the American Telephone and Telegraph Company, to the security holders of that company in connection with the annual report of the directors for the year ending December 31, 1914. The effects of the disturbed business conditions prevailing in this country during the past year have been felt by the telephone organization. The effect most noticeable is in the retardation of the usual growth. The increase in the number of subscriber stations was about 76 per cent of the number added in 1913, and was less than in any one of the four years previous thereto. This was not due so much to the falling off in new subscribers, as it was to the unusual number of disconnections.

This condition of economic unsettlement cannot continue indefinitely. As Mr. Vail says, either the causes must be removed, or by a period of quiet and freedom from other changes a chance be given for the new conditions to adjust themselves. With the thought in mind that if a right idea and a right understanding of the conditions which have brought about the present state of affairs were brought to bear on the solution of these questions, Mr. Vail proceeds to analyze the incidents and events which have led up to the prevailing unsettled economic and business situation, and he points out the necessity for a discontinuance of the disturbing influences which have come upon us so fast that we have been unable to adjust our affairs to meet them, and indicates what appears to be a remedy that might be easily and logically applied.

The expression of faith in the stability of the country and the conclusion that never were basic conditions better than now for a restoration and continuance of normal conditions, are inspiring. The note of warning uttered must not be ignored, and the suggestions may be in all wisdom commended to the serious consideration of all right-thinking men.

UTILIZING THE NITROGEN OF THE ATMOSPHERE.

The four principal chemical elements which enter into the composition of living organisms are carbon, oxygen, hydrogen and nitrogen. Oxygen and carbon are everywhere abundant. Oxygen occurs in both air and water. Carbon occurs in the air in the form of carbonic acid gas and is available in this form for the use of plants. The plants in turn make it available for the use of animal life. Hydrogen occurs principally in water and in organic structures in which water is a constituent. Nitrogen is consequently the only one of these elements regarding the supply of which there need be any concern. The nitrogen occurring in the soil is steadily called upon to contribute to vegetable growth, and unless the vegetable products are returned to the soil, there is danger of a gradual depletion of the soil with respect to this component. Fertilizers, consequently, are coming into fairly general use in agriculture, and a very large demand has been made upon the saltpeter deposits in Chile and Peru to supply this need. This material, however, commands a good price, and the available supply is not inexhaustible.

Nitrogen makes up approximately four-fifths of the atmosphere, and in this form is at hand in large quantities, but unfortunately in this form it is not directly usable by either plants or animals. Atmospheric nitrogen is, however, convertible into available chemical compounds by certain bacteria which normally exist in the soil, and an intelligent management utilizes this means in practical agriculture. There is, nevertheless, a large demand for nitrogen in an available form, not only for fertilizer, but for use in the industrial arts, where it is necessary for such things as nitric acid, ammonia and various compounds used for explosives, dye stuffs, etc. Methods for converting atmospheric nitrogen into suitable chemical compounds are, consequently, very desirable, providing they can compete commercially with the natural product referred to above.

The principal condition which has been found suitable for bringing about a combination of atmospheric nitrogen with other substances is a high temperature and the electric arc or other forms of electric energy have proven most successful when utilized in this way. The process is not highly efficient, and to carry it on commercially it is of first importance to have a supply of electrical energy at low cost. Such a supply is available principally in connection with hydroelectric developments, and the output of such plants can be well utilized for this purpose on account of furnishing a continuous and steady load. Such industries of this nature as have so far developed, have sprung up naturally in the neighborhood

of large water powers, such as are available in Norway and at a few places in this country, like Niagara Falls. Certain of these projects are proving commercial successes, while others, utilizing different processes, cannot as yet be said to have achieved this result. In any case, the commercial margin is so narrow that future developments may easily render the existence of such a business rather precarious, and they are indeed bold who have ventured their capital in this direction.

The economics of this question was gone into rather fully in the papers which were presented last week at the meeting in New York City, which is reported elsewhere in this issue. It is the first time that this subject has received much attention at the hands of the American Institute of Electrical Engineers. This is no doubt largely due to the fact that the problems involved are chemical, rather than electrical, in their nature, the electrical features involved being rather of an auxiliary character. But they are, nevertheless, of great interest and importance to electrical engineers, principally on account of the large amounts of power involved in such installations.

SOMETHING NEW IN CONVENTIONS.

The New England Section of the National Electric Light Association broke away from precedent last week by holding a convention at Boston in which not one prepared paper or address was scheduled on the program, and the affair was one of the most successful in the history of this flourishing branch of the national organization. The meetings were pure discussions of practical topics and the enthusiastic attendance testified to the value of this method of getting down to business as a change from the orthodox menu of formal papers followed by a brief discussion of each. Even the casual reader of our correspondent's report of the proceedings will be impressed with the amount of what might be called "efficiency matter" presented, the keynote of the convention being the presentation of questions which have given the members difficulty in central-station practice, combined with the discussion of solutions of problems in office, plant and field which have been thought susceptible of adaptation elsewhere. An entire day was given to electric vehicles in place of the informal convention upon that topic which has been a feature of New England electrical work during the past few years, and much valuable information was presented. The success of the convention, which was run at a total cost of not over $100, by no means invalidates the usefulness of meetings in which topics are treated in formal papers embracing more comprehensive views of their subjects; but it does show that an immense amount of fresh experience latent in the industry only awaits the right time and place to be brought forth for the mutual benefit of the men attending the meetings and also of the readers of the report, which is given in part in this issue, and will be continued next week.

WORK AHEAD.

Statistics show that there is a horse in the United States for every family in the country. Many farmers, of course, keep several, thus balancing the many city families who have none. But it must be remembered that the figures upon which the above statement is based were collected after the horse was eliminated from street-car work and largely displaced by the automobile for individual or family passenger transportation.

This condition helps to indicate the great possibilities yet open to the electric vehicle. For many purposes, of course, the horse cannot at the present time be supplanted. This applies particularly to farm work, although much of the hauling connected with the farm might well be done by the electric. The possibilities in urban draying have scarcely been touched yet. An immense field here awaits the efforts of the electric truck salesman and the central-station solicitor. Results of performances of wagons already in service must be ever at hand ready for the eye and the ear of the business manager whose interest has been aroused in this problem, whether it be by the loss of a faithful animal, the necessity for increasing the service, the extension of the length of haul, or merely the activity of the salesman. Alertness to the suitability of the occasion, and really hard work in convincing the needy of the suitability of the electric, together with the proper selection of the vehicle best suited to the particular work to be done, may be depended upon to result in the ever wider use of the electric. The possibilities are almost limitless, and there is lots of work ahead for somebody.

GROUND WIRES FOR TRANSMISSION LINES.

Whether the use of a ground wire, strung above the conductors of a transmission line, is much of a protection against disturbances due to lightning, is a disputed question. Some operators claim that there is much less trouble in the presence of a ground wire; others say there is little, if any, advantage—certainly not sufficient to warrant the expense.

Unfortunately there is not as yet sufficient experimental evidence to give a conclusive answer on this point, especially as to whether the advisability of grounding depends in any way upon the working voltage of the line—that is, upon the normal insulation. While it is certain that a ground wire does not give complete protection, it seems advisable to use one in those parts of a line most exposed to frequent disturbance. Where used, adequate ground connections are of the utmost importance, and grounding at each pole is recommended.

Considering the uncertain state of our knowledge on this subject, and the likelihood of more definite conclusions in the future, it would seem prudent in constructing new lines to make provision for attaching a ground wire at the top of the pole, even when none is installed at the outset. Then, if desired, trial installations of ground wires can be made at selected points of the system.

Chicago Jovian League.

Martin J. Wolf, of W. N. Matthew & Brother, St. Louis, Mo., delivered a very interesting address before the Chicago Jovian League on March 15, on the subject of "Salesmanship." George C. Richards introduced the speaker. Remarks were also made by Harry Kirkland, of Pittsburgh, and A. J. Binz, of Texas.

Mr. Wolf said that we are all engaged in selling, in the broad sense, regardless of our particular field of activity and likewise we are all advertisers, as advertising and selling are synonymous. The qualifications which a successful salesman must possess are health, knowledge, systematic industry, honesty and enthusiasm. These qualifications lead to optimism which is also an essential requirement, and promote co-operation.

While all business is founded on the slogan of "service to the customer" the actual sale of a commodity can be traced to one or more of six fundamental, influencing factors, namely (1) money; (2) utility; (3) pride; (4) caution; (5) weakness; (6) self-indulgence.

Mr. Wolf laid great stress on the importance of considering selling as a science and giving it the same study that is accorded other sciences. In this connection he pointed out that the law of averages applies to human beings as well as conditions and it is possible for the salesman by observing the features of a prospect to classify him as regards mentality, temperament, etc., and approach him accordingly.

British Manufacturer of Insulated Wires and Cables in Market for American Equipment.

John C. Fuller & Son, Limited, Wick Lane, Old Ford Road, Bow, London, England, will shortly be in the market for high-speed braiding machines for covering electric wire and cables, lead-covering machinery, rubber-mixing and calendaring machinery, cable makers' testing equipment and vulcanizing plant. This company wishes to get in touch with American manufacturers who are in a position to give prompt deliveries.

Southwestern Association Convention.

The eleventh annual convention of the Southwestern Electrical and Gas Association will convene at Galveston, Tex., on Wednesday, May 19, 1915, and continue its sessions through Thursday, Friday and Saturday, May 20, 21 and 22. The secretary reports that the indications are that the coming convention will be more largely and more generally attended than ever before.

The secretary is H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Railway Manufacturers Reduce Dues.

The Executive Committee of the American Electric Railway Manufacturers' Association has decided, in view of the fact that there will be no exhibition in connection with the 1915 convention, and because of the adverse business conditions, to reduce the annual dues of the association for the year 1915, from $30 to $10. The initiation fee will remain at $15. In this connection the committee feels that it is giving evidence of its interest in the welfare of the association members.

At the same time, the association will keep up its active work. Plans are under way for the formulation of a campaign of publicity for those of the member companies which will have permanent exhibitions at the San Francisco Exposition.

The association is in touch with the Bureau of Foreign and Domestic Commerce and also with the Chamber of Commerce of the United States, and through these sources, is planning to keep its members informed as to foreign trade opportunities.

Transportation arrangements for the 1915 convention at San Francisco are gradually assuming shape. The Transportation Committee is planning to send at least four special trains to the convention, three of them originating at the Atlantic Coast.

H. G. McConnaughy, director of transportation, has in preparation the train itineraries. The equipment for these trains has already been secured, and it is the intention of the committee to give the delegates every comfort and luxury, and to arrange for a trip which will permit of a visit to all the important points of interest between Chicago and the Coast.

Electric Lighting at Panama-Pacific Exposition.

The 336th meeting of the New York Electrical Society will be held at the Engineering Societies Building, New York City, Thursday, March 25, at 8 p. m. T. Commerford Martin, secretary of the National Electric Light Association, will give an address on "Electrical Aspects and Lessons of the San Francisco Exposition."

This address will deal more particularly with the electric lighting of the Panama-Pacific Exposition. The two leading features of the Exposition are its architecture and its illumination, and the latter has been applied in a variety of new and harmonious effects involving many unique departures from the older methods. The work will be described in some detail, and will be illustrated by numerous lantern slides of the lighting effects. A brief portion of the address will be devoted to the Exposition at San Diego.

Electric Dinner at Boston.

Henry I. Harriman, president of the New England Power Company, was the chief speaker at the dinner of the General Electric Company, March 12, at the Copley-Plaza Hotel, Boston, Mass. The lecture was illustrated by lantern slides which showed hydroelectric developments on the Androscoggin, Saco, Merrimac, Connecticut, Deerfield and Housatonic Rivers in New England. Mr. Harriman explained the growth of the industry and the gradual increase of generating plants.

The possibilities of railroad electrification through water-generated power were pointed out.

About 500 men were in attendance, including the company's sales force and representatives of central stations. C. B. Davis, New England manager, was toastmaster and at the head of the Arrangement Committee, which comprised C. B. Burleigh, manager of the Central Station Department, J. P. Felton, manager of the Supply Department, and G. F. Steele, of the Power and Mining Department.

American Railway Engineering Convention.

The American Railway Engineering Association held its sixteenth annual convention at the Congress Hotel, Chicago, March 16, 17 and 18. On March 15 the Railway Signal Association met at the Auditorium Hotel.

An exhibition of railway appliances took place in the Coliseum under the management of the National Railway Appliances Association. This was open from March 15 to 19, inclusive. Among the exhibitors were American Steel and Wire Company, Joseph Dixon Crucible Company, Edison Storage Battery Company, Electric Storage Battery Company, General Electric Company, Hubbard & Company, Hazard Manufacturing Company, H. W. Johns-Manville Company, Kerite Insulated Wire & Cable Company, National Carbon Company, The Okonite Company, Pyrene Manufacturing Company, Standard Underground Cable Company, The Prest-O-Lite Company, Western Electric Company.

Meeting of Lynn Section.

On March 10 J. G. Patterson, engineer of the New England Telephone & Telegraph Company, gave a lecture on "Some Telephone Problems" to about 150 interested members of the Lynn Section, American Institute of Electrical Engineers. Incidental to the discussion of knotty problems the speaker furnished a mass of general information in regard to an industry that in the Bell system alone now represents an investment in this country of over $800,000,000, with 16,000,000 miles of line. The New England division owns about 500,000 instruments. The new transcontinental line was interestingly described.

The Electrical Supply Jobbers' Association.

Some History—Franklin Overbagh, General Secretary—List of Members—Meeting, Chicago, Ill., March 17, 18 and 19.

The first electrical supply jobbers' association was organized at the Great Northern Hotel, Chicago, December 6, 1896. The charter members were W. W. Low, Charles E. Browne, W. N. Matthews, R. V. Scudder, Arthur Dee and Franklin Overbagh. Between 1896 and 1904 there were four or five different associations formed, only for some reason or another to dissolve. The association that showed the greatest strength and bid fair to accomplish the most was organized in 1904, and continued until December, 1908, when the present Electrical Supply Jobbers' Association was formed at Niagara Falls, Canada.

The Electrical Supply Jobbers' Association is a clearing house for the exchange of information and experiences of the distributors of electrical apparatus and supplies in the United States and Canada. It stands for the principle of fair competition in business, as against commercial piracy. It seeks to teach its members to study the various relations of their own business, because it believes that it is a lack of business knowledge that causes industrial failures. It is opposed to the thought that all competitors are natural enemies, and it is against any plan that has for its goal the inflicting of any injury upon a competitor. It believes in the survival of the fittest, but it is in favor of teaching the unfit how to survive. In the development of a fair field for all, and in inculcating right business principles, and in establishing a better standard of practice in the interchange of business between the manufacturer and the ultimate consumer, the Electrical Supply Jobbers' Association has played a leading part. Conspicuous in the development of these standards of practice and guiding the Association in its efforts, the general secretary of the Association, Franklin Overbagh, has been a commanding figure. Mr. Overbagh was secretary of the organizations which existed between 1897 and 1904. He was general secretary of the organization which was formed just prior to the present Association, and since the inception of the Electrical Supply Jobbers' Association, in 1908, has been general secretary of that organization.

Franklin Overbagh,
General Secretary, Electrical Supply Jobbers' Association.

Mr. Overbagh began his career in the electrical business in 1880, in the operating department of the Gold & Stock Telegraph Company, in New York. Later he entered the sales department of the Weston Electric Light Company, then became connected with the United States Electric Light Company, later on the United Edison Manufacturing Company, and in 1891 he came to Chicago with the Edison-General Electric Company, and continued with this organization when it became the General Electric Company. He was associated with the latter company until 1895, when he embarked in business for himself.

The Electrical Supply Jobbers' Association is composed of the following leading distributors of electrical supplies in the United States, Canada and Hawaii:

Alabama.—Turner Electric Supply Company, Birmingham.

California.—Holabird-Reynolds Electric Company, Illinois Electric Company, Pacific States Electric Company, Western Electric Company, Gilson Electrical Supply Company, Los Angeles; Holabird-Reynolds Company, Pacific States Electric Company, Oakland; Dunham, Carrigan & Hayden Company, Electric Appliance Company, Electric Railway & Manufacturers' Supply Company, Holabird-Reynolds Company, Pacific States Electric Company, Western Electric Company, San Francisco.

Canada. — Northern Electric Company, Ltd., Montreal.

Colorado. — Hendrie & Bolthoff Manufacturing & Supply Company, Mine & Smelter Supply Company, Mountain Electric Company, New England Electric Company, Western Electric Company, Denver.

Connecticut. —Electric Supply & Equipment Company, Hartford.

District of Columbia.—Doubleday-Hill Electric Company, National Electrical Supply Company, Washington.

Florida.—Florida Electric Company, Jacksonville.

Georgia. — Western Electric Company, Atlanta.

Hawaii.— Hawaiian Electric Company, Ltd., Honolulu.

Illinois.— American Electrical Supply Company, M. B. Austin & Company, Central Electric Company, Commonwealth-Edison Company, Dearborn Electric Company, Electric Appliance Company, Illinois Electric Company, Inland Electric Company, Monarch Electric & Wire Company, North Shore Electric Company, Western Electric Company, Chicago.

Indiana.—Varney Electrical Supply Company, Evansville; Indianapolis Electric Supply Company, Varney Electrical Supply Company, Western Electric Company, Indianapolis.

Iowa.—J. B. Terry Company, Cedar Rapids; McGraw Company, Sioux City.

Kentucky.—James Clark, Jr., Electric Company, Louisville.

Louisiana.—Electric Appliance Company, Electrical Supply Company, Western Electric Company, New Orleans.

Maryland.—Southern Electric Company, Baltimore.

Massachusetts.—George H. Buckminster Company, F. S. Hardy & Company, Pettingell-Andrews Company, Stuart-Howland Company, Western Electric Company, Wetmore-Savage Company, Boston.

Michigan.—W. J. Hartwig Company, McNaughton-McKay Electric Company, Miller-Seldon Electric Company, Frank C. Teal Company, Henry L. Walker Company, Detroit; C. J. Litscher Electric Company, Grand Rapids.

Minnesota.—Northern Electrical Company, Duluth; Electrical Engineering Company, Northern Electrical Company, Western Electric Company, Minneapolis; Northwest rn Electric Equipment Company, St. Paul Electric Company, St. Paul.

Missouri.—B-R Electric & Telephone Manufacturing Company, Funsten Electric Company, Kansas City Electrical & Telephone Supply Company, Western Electric Company, Kansas City; Columbian Electrical Company, St. Joseph; Wesco Supply Company, Western Electric Company, St. Louis.

Montana.—Butte Electric Supply Company, Montana Electric Company, Butte.

Nebraska.—Korsmeyer Company, Lincoln; McGraw Company, Mid-West Electric Company, Western Electric Company, Omaha.

New Jersey.—Newark Electrical Supply Company, Newark.

New York.—Esco Electric Supply Company, Havens Electrical Supply Company, Inc., Albany; Brooklyn Electrical Supply Company, Brooklyn; McCarthy Brothers & Ford, Robertson-Cataract Electric company, H. I. Sackett Electric Company, Western Electric Company, Buffalo; Alpha Electric Company, Inc., Central Electrical Supply Company, Fullerton Electric Company, W. F. Irish Electric Company, E. B. Latham & Company, Charles W. Leveridge, Inc., Mine & Smelter Supply Company, Northwestern Electric Equipment Company, Royal-Eastern Electrical Supply Company, Sibley & Pitman, Stanley & Patterson, Inc., Western Electric Company, New York; Wheeler-Green Electrical Supply Company, Rochester; H. J. Gorke, Mohawk Electrical Supply Company, H. C. Roberts Electric Supply Company, Syracuse Supply Company, Syracuse; Troy Electrical Company, Troy.

Ohio.—Post-Glover Electric Company, Western Electric Company, Cincinnati; Erner Electric Company, Lockwood-Luetkemeyer-Henry Company, Republic Electric Company, Western Electric Company, Cleveland; Erner & Hopkins Company, Columbus; The F. Bissell Company, Toledo.

Oregon.—Fobes Supply Company, Pacific States Electric Company, Portland.

Pennsylvania.—J. F. Buchanan Supply Company, Elliott-Lewis Electrical Company, Inc., Jones-Beach & Company, Novelty Electric Company, Philadelphia Electric Company Supply Department, H. C. Roberts Electric Supply Company, Rumsey Electric Company, Frank H. Stewart Electric Company, Western Electric Company, Philadelphia; Doubleday-Hill Electric Company, Iron City Electric Company, W. T. McCullough Electric Company, Robbins Electric Company, Union Electric Company, Western Electric Company, Pittsburgh; Fullerton Electric Company, The Charles B. Scott Company, Scranton.

Rhode Island.—Belcher & Loomis Hardware Company, Union Electric Supply Company, Providence.

Tennessee.—Electric Supply Company, Memphis.

Texas.—Electric Appliance Company, Southwest General Electric Company, Western Electric Company, Dallas; Mine & Smelter Supply Company, Southwest General Electric Company, El Paso; Southwest General Electric Company, Tel-Electric Company, Houston.

Utah.—Capital Electric Company, Inter-Mountain Electric Company, Western Electric Company, Salt Lake City.

Virginia.—Tower-Binford Electric & Manufacturing Company, Western Electric Company, Richmond.

West Virginia.—H. S. Sands Electric & Manufacturing Company, Wheeling.

Washington.—Fobes Supply Company, North Coast Electric Company, Pacific States Electric Company, Western Electric Company, Seattle; Washington Electric Supply Company, Spokane.

Wisconsin.—Julius Andrae & Sons Company, C. J. Litscher Electric Company, Milwaukee.

The Association, since its Niagara Falls meeting, in 1908, has held quarterly meetings for the discussion of business topics. The meeting which was held at the Hotel La Salle, Chicago, March 17, 18 and 19, was most important in the interest aroused and in the large attendance of members from all over the country, and the participation of the manufacturers of electrical apparatus and supplies in the sessions.

The first day was devoted to a meeting of the geographic divisions to elect members of the executive committee. Later on the annual reports were read and committees elected.

The executive committee of 15 members was reelected. F. S. Price, Pettingell-Andrews Company, Boston, Mass., was elected chairman of the Eastern Division, and N. G. Harvey, Illinois Electric Company, Chicago, was elected chairman of the Central Division.

The second day was devoted to a joint meeting of the manufacturers and jobbers in the morning, and to a routine meeting of the jobbers in the afternoon.

The third day was devoted to a morning executive session, and a visit to the Hawthorne works of the Western Electric Company.

The subjects for discussion included the following: "Reasonably Permanent List Prices," "Relations Between Producer and Distributor," "The Relation of Turnover to Gross Profits," "Uniform Accounting System," and "The Philosophy and Ethics of Industry."

The English Electrical Development Committee.

Following upon our recent reference to the work that is to be undertaken by this new committee in England, J. W. Beauchamp, acting honorary secretary, furnishes the following list of members and the interests they represent.

Representing the Incorporated Municipal Electrical Association: S. E. Fedden, chairman; S. T. Allen, F. Ayton, A. S. Blackman, R. A. Chattock, A. C. Cramb, Coun. Crowther, J. E. Edgcome, Ald. Ellaway, F. M. Long, H. Richardson, Ald. Pearson, H. F. Proctor, T. Roles, A. H. Seabrook, J. Smith, W. A. Vignoles, G. Wilkinson, J. W. Beauchamp, acting honorary secretary.

Representing the Association of Municipal Electrical Engineers: W. C. P. Tapper.

Representing the manufacturers: R. J. Ireland, British Thomson-Houston Company; G. Maurice, General Electric Company; H. C. Siddeley, Lancashire Dynamo Company; D. N. Dunlop, secretary.

Representing Electrical Contractors' Association: L. G. Tate.

Representing Cable Makers' Association: L. B. Atkinson, W. T. Glover & Company, Limited.

Representing Association of Electrical Power Companies: W. A. Chamen, A. de Turckheim.

Representing British Electrical Federation: W. L. Madgen.

Representing Society for Electrical Development, U. S. A.: F. W. Wilcox.

Sub-committees were appointed to deal with the following matters:

(1) Publicity, secretary, A. C. Cramb.

(2) Electrical Installations, secretary, T. Roles.

(3) Domestic Appliances, secretary, S. T. Allen.

FEDERAL TRADE COMMISSIONERS' POWER TO INVADE LARGE AND SMALL BUSINESS HOUSES IN SEARCH OF EVIDENCE.[1]

By Elton J. Buckley.

Trade questions of law continue to arise under the recently enacted Clayton anti-trust act. For example, I have received the following during the week from a New York trade paper:

> We are prompted to ask if you have prepared anything relative to the effect of the enforcement of the Clayton Act?
>
> It has been intimated to us that this measure, through the processes of the trade commission that is authorized, can invade any business office and call for correspondence and records—not simply the offices of large concerns, but all concerns.
>
> If such is the case, an article along this line might be interesting.

Now that Congress has passed the Clayton anti-trust act, which is an amendment to the familiar Sherman anti-trust law; and the Federal Trade Commission act, which transfers to a Government commission the authority over business which was formerly exercised by the Bureau of Corporations, the situation in a nutshell is this: The Clayton law forbids various acts, which the law holds tend to restrict competition and create monopoly. Practically nothing is said in the act as to how the Government shall proceed to get evidence when it enforces the law, except the provision in Section 11 that authority to enforce the principal sections, where they refer to business, shall be vested in the Federal Trade Commission. It should be understood that the two are companion acts, and will operate together.

The Federal Trade Commission act has its core in Section 5, which simply provides that "unfair methods of competition in commerce are hereby declared unlawful." The balance of the act is devoted to creating a Federal Trade Commission, not only to enforce the above provision regarding unfair methods of competition, but also the provisions of the Clayton act which are to some extent along the same line. How the Commission will work is set forth in the Federal Trade Commission act, and this brings me to answering the above inquiry, which in substance is, how will the Government go to work, when it has reason to believe that somebody is indulging in unfair methods of competition, or is violating the Clayton anti-trust act in some of the ways set forth? Has it the power to descend upon any business concern, large and small, and root into its books and its papers, if it believes there is evidence there for the case it expects to bring?

1 Copyright, 1914 by Elton J. Buckley.

My judgment is that the Government is given by the Federal Trade Commission act this very power, and that business houses of all descriptions, large and small, may legally be called upon at any time to open up their archives and bid the United States Government look in.

Section 6 of the Federal Trade Commission act, touching this point, is as follows:—

> Sec. 6. That the commission shall also have power:—
>
> (a) To gather and compile information concerning and to investigate from time to time the organization, business, conduct, practices and management of any corporation, engaged in commerce, excepting banks and common carriers subject to the act to regulate commerce, *and its relation to other corporations and to individuals, associations and partnerships.*

I italicize the last clause, because if the Government has power to investigate a corporation, *in its relations with other concerns,* naturally under this power it could go into the offices of these other concerns and see what evidence it could find, bearing of course, upon the original inquiry.

The act provides that the word "corporation" in the above provision shall mean "any company or association incorporated or unincorporated, which is organized to carry on business for profit, and has shares of capital or capital stock, and any company or association, incorporated or unincorporated, without shares of capital or capital stock, except partnerships, which is organized to carry on business for its own profit or that of its members."

There are several other provisions in the Federal Commission act which give the new body powers of investigation, etc., but clause (a) of Section 6, which I have reproduced, is the main one and from that the Commission gets the most of its power, aided by Section 9, as follows:—

> Sec. 9. That for the purpose of this act the commission, or its duly authorized agent or agents, shall at all reasonable times have access to for the purpose of examination, and the right to copy any documentary evidence of any corporation being investigated or proceeded against,
> * * *

It is not made quite clear what the "documentary evidence of any corporation" is, but I cite the provision to show in a general way the scope of the Commission's powers.

I will try to show, by a concrete case, under what conditions the Government will probably exercise this power, which it clearly seems to have, to invade business concerns of all kinds.

Let us say that a large corporation, located in New York or in some other business center, is brave enough or foolish enough to run counter to this new combination of laws. It sells the jobbing or the retail trade—it makes no difference for the purpose of this illustration—and it has sent letters and literature to its customers in furtherance of the scheme, whatever it is, which the Government is alleging is in violation of law. These letters and papers are supposed to be on file in the offices of the concern's various customers. In addition thereto, those customers' books, let us say, may show prices or payments, or discounts which confirm the arrangements made in the letters. Still again, the letter books of those customers might show copies of letters written to competitors of the concern under investigation, under pressure from the latter, which would also be a part of the original scheme.

In my opinion, the Government would have the power, under this law, to go *anywhere* in search of evidence of this character, and it therefore behooves retail and wholesale concerns who handle products of concerns liable to run afoul of the anti-trust acts, to live accordingly. Section 10 imposes a fine of $1,000 to $5,000 or imprisonment of not more than one year, or both, upon any person who neglects or refuses to produce documentary evidence in obedience to the lawful requirements of the Commission.

Consular Recommendations on South American Trade.

That the United States has in the last few years been making steady advances in the markets of the various South American countries is plainly brought out in a publication just issued by the Bureau of Foreign and Domestic Commerce, entitled "Consular Recommendations on South American Trade."

Consular recommendations are well summarized in a report from Rosario, Argentina, which states that the principal factors in extending American trade may be included under five heads: investment of American capital, steamship facilities, credits, direct personal effort and willingness on the part of American manufacturers to comply with local requirements. The matter of credits is constantly emphasized and an illustration is given of how the usual American practice of insisting on cash with order or cash against shipping documents works a hardship to South American importers.

The publication referred to is of 29 pages and is being distributed at five cents a copy by the Superintendent of Documents, Government Printing Office, Washington, D. C.

Oklahoma Utilities Convention.

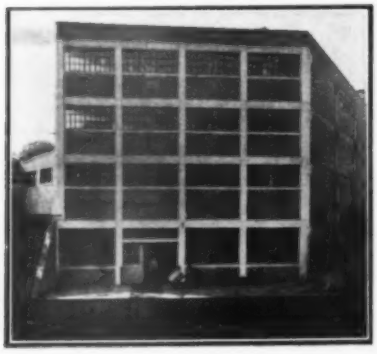
The fourth annual convention of the Gas, Electric and Street Railway Association of Oklahoma will be held in the Lee-Huckins Hotel, Oklahoma City, on May 12 to 14, inclusive. Harold V. Bozell, of Norman, Okla., is secretary.

A Notable Southern Jobber—The Electric Supply Company, Memphis, Tenn.

Some Facts Relating to an Up-to-Date Electrical Supply House Devoted Strictly to Wholesale Business.

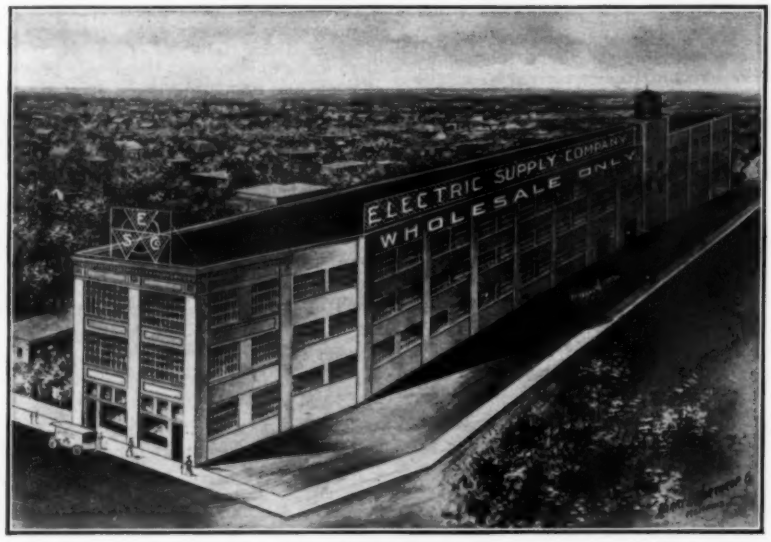
The Electric Supply Company, Memphis, Tenn., is one of the most enterprising distributors of electrical material in the country. The officers are C. H. Harvey, president; W. R. Herstein, secretary and treasurer. The latter is an especially commanding figure in electrical circles, an ardent Jovian, under whose direction Memphis has become conspicuous for its progressiveness in correlating the efforts of civic and electrical business interests in developing the community. He is also prominent in the councils of the Electrical Supply Jobbers' Association and an active participant in many other organizations devoted to the business and social welfare of Memphis and surrounding southern cities.

The Electric Supply Company, which for many years has stood in the forefront in establishing modern methods of doing business, completed about four months ago its new office and warehouse building. This, in many respects, is a model



Rear of Warehouse of Electric Supply Company, Memphis, Tenn., Showing Loading Platform.

of its kind. The building is of reinforced concrete, faced with white glazed tile, and is 40 feet wide by 236 feet in length. It is comprised of three stories and basement, the configuration of the building lot being such that the basement floor is on a level with the tracks of the Southern Railway. This arrangement allows the provision of a concrete loading platform, 10 feet by 40 feet at the rear of the building and abutting on the railroad's right-of-way. An electric elevator of three-ton capacity, with a 10-foot by 11-foot platform, gives ready access from the basement to the three other floors for any kind or size of article it may be desired to handle. The dimension of 11 feet in the elevator platform was used to accommodate rigid iron conduit which comes in 10-foot lengths, so as to handle conduit on the elevator in a horizontal position, as it has been found dangerous to handle it in an upright or slanting position on a moving elevator.



The New Office and Warehouse of the Electric Supply Company, Memphis, Tenn.

The basement of the building besides being used for shipping and receiving purposes, contains porcelain, dry battery, and glass insulator stocks, other extremely heavy material, and the steam heating plant, with which the building is equipped.

Office of the Electric Supply Company, Memphis, Tenn.

As the company does no retail business, the front of the first floor is given up to the city delivery counter, together with the vestibule leading up to the sec-

ond floor, on which the offices are located. Immediately to the rear of the city counter is a tile partition containing a doorway, back of which are located between five and six hundred bins containing the shelf stocks. The bin arrangement is exceedingly compact, and the entire shelf stock is within 25 feet of the city counter clerks. Within this same distance, is located a dumb waiter, extending to the upper floors, which enables the counter clerks to handle their entire duties without ever leaving the counter for a distance exceeding 25 feet. This

Views in Several Departments of the Electric Supply Company, Memphis, Tenn.

very materially expedites the handling of city trade, and saves contractor customers considerable of their workmen's time.

On the first floor there are also located the wire, lamp cord, and conduit stocks, as well as any other material in the disposition of which the question of weight is to be considered. The shipping and packing clerks are also located on this floor, which, being on the street level, with a 16-foot court running the entire length of the building, and three double delivery doors, enables the company to accommodate quite a number of trucks, drays and express wagons at one time.

On the second floor front is located the general office, which occupies a space of 40 feet by 75 feet, two sides of which are practically all glass All of the old furniture was discarded when the stocks and equipment were moved to the new building, and a complete equipment of sanitary office furniture was installed. With the floor entirely covered with cork linoleum, fresh white walls, ample ceiling height, uniform desk and cabinet furniture, the layout easily adapted itself to the use of modern ideas in illumination, and the general effect is striking. The whole aspect indicates comfort, dispatch and efficiency. The remainder of the second floor contains the stationery rooms, wash rooms, in addition to which there is also space for the stock of motors, generators, fan motors, and other material.

The third floor is devoted mainly to incandescent lamps, and also contains the stock of shades, reflectors, arc lamp globes, wood pins, brackets, cross arms.

It is interesting to note that the company has secured an insurance rate of 44 cents per $100 on the stock, and 15 cents per $100 on the building proper, which, it is believed, will compare favorably with the insurance rates paid by any other jobber in the country.

EXCLUSIVE AGENCIES AND THE CLAYTON ACT.

Important Sections the Subject of Different Interpretations — Does the Law Prohibit All Exclusive Sales Contracts?

Some time ago, *Public Service Regulation*, Chicago, published a very interesting commentary regarding the Clayton act and exclusive agencies. This communication was prepared by that journal's Washington, D. C., correspondent, and because of its bearing upon many questions intimately connected with the manufacture and sale of electrical material, is quoted below, in full:

"What are termed the 'Price Discrimination' and 'Exclusive Agency' sections of the Clayton anti-trust law are the occasion for much speculation and concern on the part of manufacturers and jobbers, and many members of Congress are in receipt of requests from their constituents asking for an official interpretation of these important provisions. These communications show that a marked difference of

opinon exists among manufacturers and attorneys regarding these sections, especially touching those clauses of the law relating to exclusive sales contracts. This difference of opinion, as to the exact application of the terms of the law, exists also among members of both houses of Congress.

"In some quarters one may hear the assertion made that the Clayton act absolutely prohibits all exclusive sales contracts; in other congressional quarters, equally as well informed on the intent and purpose of the law, the opinion prevails that the act does not make all exclusive sales contracts illegal, and that its provisions only apply to those contracts which create an actual monopoly, or are designed substantially to lessen competition.

"Under this latter interpretation, the majority of exclusive sales contracts are not prohibited by the law, as only a minimum number of such contracts, it is asserted by trade experts in the government departments, are executed with an intent to monopolize, or to lessen competition. By far the greater number of such contracts, it is said, are made to extend trade and maintain prices, and the most experienced authorities referred to hold that such purposes and intent do not violate the Clayton act.

"However, no official interpretation of this 'exclusive agency' provision of the law is possible at this time. This is one of the problems that will confront the new Federal Trade Commission.

Disputed Provisions of the Law.

"These 'Price Discriminations' and 'Exclusive Contracts' provisions of the Clayton act are embraced in Sections 2 and 3. Stripped of their legal verbiage, these sections provide in substance as follows:

"Section 2. It shall be unlawful for any person to discriminate in prices between different purchasers of commodities sold for use or resale within the jurisdiction of the United States where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, provided that it shall not be unlawful to discriminate in prices between purchasers of commodities on account of the difference in grade, quality or quantity of the commodity sold, or that makes allowance for difference in cost of transportation, the discrimination in the same or different communities being made in good faith to meet competition; provided, that it shall not be unlawful for one to select his own customers in bona fide transactions not in restraint of trade.

"Section 3. It shall be unlawful for any person to sell or contract for sale of any commodity, or fix a price therefor, or discount from or rebate upon such prices on condition or understanding that the purchaser shall not deal in the goods of a competitor of the seller where the effect of such sale, or contract for sale, may be to substantially lessen competition, or tend to create a monopoly.

"The interpretation of the scope of these leading provisions was a matter of such importance to the membership of the National Implement and Vehicle Association, that General Manager McCullough submitted these sections of the law to the association's attorneys for analysis and opinion.

Sections Legally Analyzed.

"From the bulletin giving the views of counsel the following extracts may prove of interest, especially to manufacturers:

"'We are of the opinion that under both sections of this act above referred to, it is purely a question of fact under all the circumstances whether such a contract does violate the act. It is specifically provided in Section 3 as follows: "Where the effect of such sale or contract for sale may be to substantially lessen competition or create a monopoly." Therefore, it is apparent that such a contract in itself is not declared illegal, unless by virtue of that contract it does substantially lessen competition or create a monopoly.'

"'We are aware that in many instances contracts giving dealers exclusive right to handle a single line of goods in a territory has been the life of competition, and we believe that if the conditions warrant or show that such a condition exists and that the contract does promote competition, notwithstanding it may be exclusive in its terms, that it does not come within the provisions of the act.'

"'However, we must not lose sight of the fact that under this act, a person who thinks he is injured in his business may sue in the District Court of the United States without respect to the amount in controversy, and recover three times the amount of his damage, together with his costs and attorney's fees. Another remedy is by complaint to the trade commission and an investigation by that commission.'

"'We will say further that similar acts passed by some of the states, although without some of the exceptions contained in this act, have been sustained. The acts of the states, however, are generally more stringent than this act. For instance, the exclusive contract law of the state of Texas is more strict in its terms than the act here. The unfair-competition law of the state of South Dakota is more strict in its terms than this law because this act does permit a manufacturer to select his own customers; it does make it a positive condition that the contract, rebate, price, or discount must have a tendency to lessen competition or create a monopoly. The act does not declare a contract giving to a person the exclusive right to sell, absolutely illegal: it must be shown that the contract has a tendency to lessen competition or creates a monopoly and in that respect it is dissimilar from the act of Texas, which declares that such a contract is illegal.'

"'In view, however, of the tendency of the times and that large powers are given to the Federal Trade Commission, we feel that as this is a new and untried law, and as there is practically no precedent, except as we have above indicated, established as a guide, we feel that great precaution should be used.'

"'This act might be construed strictly, and possibly it is the intent of Congress that it should be so construed, and the rule of reason applied in the tobacco cases should not be applied if a case should be brought before the courts under this act.'

Views of Judiciary Committee.

"It may be of interest to note, in this connection, the views of the House Committee on the Judiciary on the provisions under consideration. This is the committee of which Judge Henry D. Clayton, of Alabama, was chairman at the time the bill was framed and passed the House of Representatives. In its report recommending passage, the committee submitted a carefully prepared analysis of each important provision of the bill.

"It was this committee which gave the name 'tying' contracts to the exclusive agreements referred to in the bill. The committee holds to the view that the terms of the bill do not prohibit or forbid exclusive agencies; in fact, it held that the law was not designed to apply to agencies properly so termed. The views of the committee harmonize in a general way with the opinion rendered by the attorneys of the National Implement Association.

"Treating of Section 3 of the bill, regarding exclusive contracts, the committee said:

"'This section of the bill has apparently been much misunderstood, and great confusion seems to have arisen in regard to its provisions. Whether designedly or from a misunderstanding of its purport, we know not, but it has been contended very earnestly that its provisions prevent exclusive or sole agencies. It not only does not prohibit or forbid exclusive agencies, but, on the contrary, it in no way whatever relates to agencies properly so termed. Let us therefore consider what this section really accomplishes. It prohibits the exclusive or "tying" contract made

between the manufacturer and the dealer by purchase or lease, whereby the latter agrees, as a condition of his contract, not to use or deal in the commodities of the competitor or rival of the seller or lessor. It is designed merely to prevent this unfair trade practice now so common throughout the country, and which is generally regarded by everyone who has given the subject any serious consideration as unjust to the local dealer and to the community and as monopolistic in its effects. The section provides that any person engaged in commerce who either leases or makes a sale of goods, wares and merchandise in the United States or in any places under its jurisdiction on the condition or understanding that the lessee or purchaser thereof shall not use or deal in the goods, wares, merchandise, machinery, supplies, or other commodities of a competitor of either the lessor or seller shall be deemed guilty of a misdemeanor and punished as provided in the section. The words "or fix a price charged therefor or discount therefrom or rebate upon such price" are merely descriptive of the different methods used by the manufacturers to induce the dealer or local merchant to enter into this exclusive or "tying" contract, which obligates him to surrender a right which every dealer should enjoy, namely, to handle any manufacturer's goods, wares, or merchandise he sees fit to handle. Of course, the manufacturer must offer some very flattering and extraordinary inducements on his part, for otherwise no dealer would be foolish enough to enter into any such contract. The first inducement in every case must of necessity relate to price.'

" 'By fixing the price so high that the retail dealer will make an extraordinary or unusual profit on the commodities actually sold, the manufacturer is enabled to induce him to enter into an arrangement whereby the local dealer can actually increase his profits for the time being at least by giving up his entire trade in competitive commodities which he is compelled to handle on a small margin. But, rest assured that, when the local dealer enters into such a contract and gives up a portion of his trade to rivals, he at once attempts by the aid of the manufacturer to establish a monopoly in the trade of the commodity handled under the exclusive contract and sold at a higher profit. If the transaction results in completely driving out competitive articles from the community as the contract by its terms takes them out of the business of the local dealer, there can be little room to question the contention of the advocates of this system that both the manufacturer and the dealer are benefited by the transaction. If, on the contrary, the local merchant who has tied his hands by an exclusive contract cannot drive out of the community competitive articles and thereby secure a monopoly of the trade in his immediate locality, it is manifest that he has been seriously hampered and injured in his business by the restrictions placed upon him by his contract. But the advocates of this system and practice of monopoly, in dealing with this question, never look beyond the manufacturer or the local dealer to the millions of American consumers who are compelled to purchase daily the necessary food, raiment, and all the necessities of life through the ordinary channels of trade in their respective communities. What about the interest of consumers—the general public—the American people, as a whole? How do they fare under this unnatural arbitrary system and trade practice devised by American manufacturers and put in operation by great and powerful combinations in trade for their own enrichment and with the ultimate view of obtaining a complete monopoly in their special line of industry? Undoubtedly, the system results in higher prices to consumers. Great department stores and mail-order houses flourish under it. Local customers cannot purchase or obtain at their local stores particular commodities desired and often necessary, and hence are compelled to send their money abroad in order to secure the desired commodity which ought under any fair system to be procurable in their local community through their local dealer. On account of this very condition, the temptation to the local merchant is very strong to break away from his contract and to deal in the commodities of others. The needs of his customers demand constantly that he should do so.'

" 'The customer having once gone to another dealer or procured the desired commodity through a mail-order house may not return to his local dealer and the goods purchased under an exclusive or "tying" contract may remain on the shelves of the local merchant unsold. The local dealer has invested his money in them; he has paid for them; they belong to him. But the manufacturer has a contract that binds him not to deal in other like commodities. So every such contract provides for a discount from or rebate upon such price as a further inducement for the local merchant or retailer to enter into a discriminating contract which ties his hands. * * *'

" 'The local dealer is required under the contract system to purchase and pay for each article secured for his business. He is required to contract for purchase on condition that he will not deal in like articles manufactured by competitors. If he cannot sell the commodities so purchased, he must go out of business. It was shown in testimony before the committee during the recent hearings that a certain automobile manufacturing company, with a capital of only $2,000,000, had made a profit of $25,000,000 net on their investment in a single year. Was that a profit on the $2,000,000 actually invested by the manufacturing company? Not at all. It was the profit on that $2,000,000 supplemented by many times that many millions actually invested by local dealers in the machines of that company by so-called selling agencies throughout the country. The selling agencies are not in reality agencies at all, but are purchasers and owners of machines who have paid the full price therefor under contracts conditioned that these same dealers will not deal in the machines of any competitor or rival company. These extraordinary profits have been made largely on money actually invested in machines by customers, hundreds of which remain unsold in the possession of the local dealer. This illustration alone is sufficient to show the absolute unfairness of any such practice or system. The system is wholly bad for consumers and the general public, and in its last analysis detrimental to the interests of local dealers generally.'

"Under the original draft of the bill the practices referred to were penalized and made a misdemeanor, but this clause was stricken out. Section 4 of the act, however, authorizes any person who shall be injured in his business or property, by reason of anything forbidden in the anti-trust laws, to sue therefor, without respect to the amount in controversy, and recover threefold the damages sustained, and also the cost of such suit, including attorney's fee.

"Whether the penalties stipulated for violations under the Sherman Anti-Trust law are applicable to the two sections in question is a matter generally believed to rest largely, if not exclusively, with the Federal Trade Commission, to whose jurisdiction the enforcement of these important provisions is specifically assigned."

Society for Electrical Development Issues Successful Selling Suggestions.

A valuable book of 56 pages entitled "101 Successful Selling Suggestions" has been compiled by the Society for Electrical Development, Incorporated, for the benefit of all employees of its members who are engaged in selling anything electrical. These suggestions were carefully selected from 750 sales ideas submitted.

"PROMPT SHIPMENT" — WHAT DOES IT MEAN IN BUSINESS CONTRACTS?[1]

By Elton J. Buckley.

Two large Eastern houses are deep in a lively controversy over the meaning of the word "prompt" when it is used to describe time of shipment. In other words, what does "prompt shipment" mean? The particular article that the controversy is about is potatoes, but it might be anything else. There is always more or less uncertainty in buyers' and sellers' minds as to just what a seller obligates himself to do when he agrees to "prompt shipment"; and if a controversy arises later it is very often found that buyer and seller are far apart in their understanding of what was meant by prompt shipment.

Therefore something in this article as to the legal meaning of prompt shipment.

In the case I have referred to, the buyer ordered a car of potatoes "prompt shipment." He needed them to fill a municipal contract, but that is not important, as he did not tell the seller.

The seller was slow about filling the order, but got the car loaded in six days from the time he received the order. Even this was only after he had received several letters from the buyer, urging haste. By the time the car reached its destination the buyer had had to buy elsewhere to protect his contract, and more than that the market had decidedly declined. The buyer therefore refused to receive the car, on the ground that shipping in six days was not prompt shipment.

Of course, if his contention was correct, his course was perfectly right. Needless to say he would have had neither a legal nor a moral right to reject merely because the price had dropped.

The seller at once locked horns, making the counter contention that prompt shipment meant shipment within *ten* days. Having shipped in six, he claimed that he was well within his contract. The buyer claimed that prompt shipment meant shipment within three days, and there the issue joined. The case will doubtless have to be fought out in court; just because two men did not see fit to express their exact meaning in apt words, instead of using a general term that can be interpreted many ways. If the buyer wanted his potatoes in three days, he could easily have said so, and avoided this controversy.

Now what does "prompt shipment" mean?

The courts have laid down no rule which will apply to all cases. Each case is a law unto itself, upon its own particular c i r c u m s t a n c e s. Naturally "prompt" has a different meaning with peaches than it does with dress goods. All that the courts have done is to lay down the general principle that "prompt is synonymous with quick, sudden, precipitate." One New York case made the following definition:—

> Prompt shipment as used in a contract which provides that certain rails should be promptly shipped from Europe to New York, means *with expedition, directly or at once.* It admits of less delay than would be permitted if the shipment were within a reasonable time.

Wherever goods are ordered, and no time is set for their shipment, the law is that they must be shipped within a reasonable time. What is a reasonable time depends on the peculiar circumstances of the given case. Therefore, where a contract calls for prompt shipment, it means quicker shipment than where shipment is merely to be made within a reasonable time.

In another case in which the meaning of prompt shipment came into question, the general principle was laid down that prompt meant "ready, quick, expeditious."

This being applied to the potato case, means, I take it, that the seller was under obligation to hustle about and get the potatoes off at the earliest convenient moment. There is no warrant whatever in the cases for his contention that he had ten days in which to make the shipment, or even six. "Quickly," "suddenly," "expeditiously," or "precipitately" certainly mean nothing like ten days.

My experience is that in business contracts for the sale of goods, there is far too much use of indefinite phrases that mean one thing to the seller and another to the buyer. If the seller of the potatoes had any idea that he had to ship within three days, he might not have made the contract at all, nor would the buyer if he had dreamed that the seller had ten days. This shows how the indefinite meaning of a word like "prompt" can really break a contract wide open. No word should be allowed to get into any business contract, the meaning of which is not fixed, universally agreed upon, and *definite*. There is no room whatever for argument or doubt as to the meaning of a provision that "shipment is to be made within three days from the date hereof," and the terms ought to be expressed just that definitely.

1 Copyright, January, 1915, by Elton J. Buckley.

James J. Hill an Optimist on Electricity.

The Northwestern Electric Equipment Company, St. Paul, Minn., publishes a most interesting monthly called "The Northwestern Buzzer." The usual features of merit are well worthy of careful attention. Particularly interesting is the article in the February issue, entitled "Electricity, the Most Adaptable Physical Force," by James J. Hill. The editor, J. M. Hannaford, Jr., manager of sales of the company, is to be congratulated, and with his permission the article is reprinted as follows:

"The steam engine revolutionized the industrial world. But steam power must be applied directly to the work to be done. Electric energy can be carried almost anywhere and into it other physical forces may easily be transformed. It has, therefore, taken the place of millions of human hands. Nor is there any ascertained limit to the uses to which it may be put.

"A large proportion of the people now living in Saint Paul can remember when every street car in the city was dragged by animal power; when the first sputtering arc lights on street corners or in large halls, to which they were adapted, were curiosities; when electric house lighting was unknown; when the hundreds of commercial and household devices operated by electric power had no existence outside of some dim idea in the inventor's brain. A great transformation has been wrought in the life-time of a single generation.

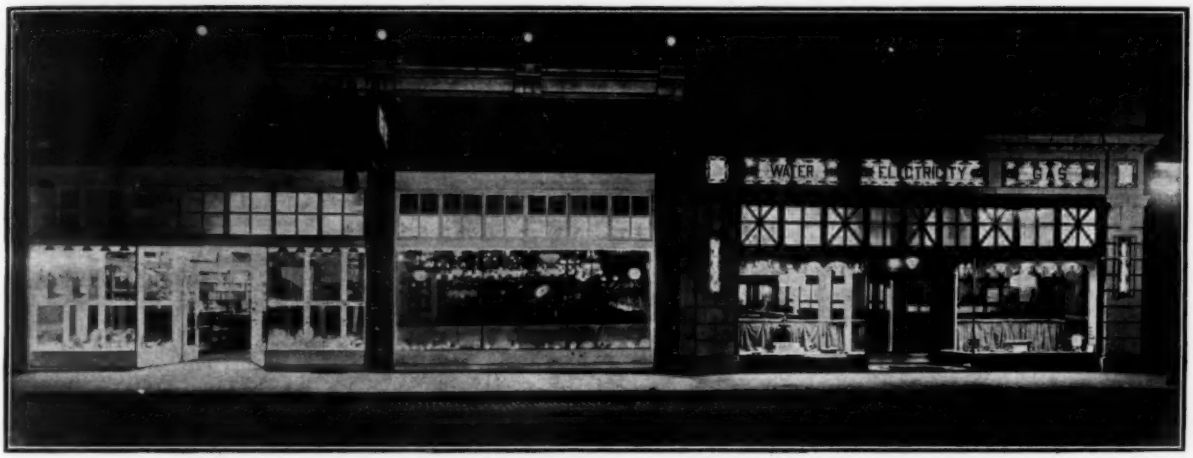
"Railroad engines, street cars, elevators, all sorts of light power machinery are now fitted with electric motors. The mysterious force is busy about our houses, lighting, sweeping, sometimes heating them, and performing deftly and quietly scores of lesser tasks. Seeing what has already happened, it is hard to imagine any kind of physical service to which this modern force may not possibly be applied.

"The country, too, calls for it. Trolley cars and telephones now reach much of our farm area. But as soon as the demands of the cities have been supplied, the electrical invasion will bring more ease and comfort to the workers on the land. Especially is there room for it in the as yet imperfectly supplied Northwest. Much of the manual labor about farm buildings might be performed by this supple agent that already knows how to milk a cow.

"At any moment some new method of transforming latent or unutilized forces into electricity may make possible another advance as important as the progress of its past. Edison has more than once believed himself to be on the point of generating electricity from coal without combustion. Wind power and the pull of gravity may be available possibilities.

"The earth as a natural magnet, and the atmosphere as a reservoir of electrical energy, may be drawn upon by some happy find or some studious combination of inventive genius.

"Saint Paul is not only a valuable home market for electrical appliances, but a supply point for the Northwest. Few predictions are so safe as that the scope



Rush Brothers' Electrical Supply and Fixture Store Adjoining Public Utility Headquarters.

General Supply Department, Rush Brothers.

and the practical utility of electrical improvement and adaptation will be vastly extended. They are working and growing factors in the life of this as of every other city. They have in the future, perhaps, their greatest acts to perform in the continuous performance of our changing world."

Rush Brothers Open New Electrical Supply Store at Hot Springs, Ark.

Rush Brothers, electrical supply dealers and contractors of Hot Springs, Ark., opened their new place of business at 911 and 913 Central Avenue, adjoining the public utilities office, on the evening of February 28. A general invitation had been extended to the public, and notwithstanding bad weather hundreds of residents and visitors were present. It was the consensus of opinion that the display was well arranged and reflected high credit upon the men promoting the enterprise.

For the general supply department there is available a room 23 feet by 78 feet, with a basement of the same dimensions, and there is also a room 20 feet by 78 feet devoted exclusively to fixtures, with a basement underneath 43 feet by 78 feet. A glass partition divides the supply room and the fixture department, and there is also a glass partition between the fixture room and the office. The office is so arranged that that department can oversee the work of both the supply department and the fixture room.

All lights in the fixture room are controlled by individual pull switches, and the fixtures are marked in plain figures so that the customer can turn on and off the lights and get full information respecting the individual equipment. The work shop is located in the basement, which is also used as a surplus stock room.

On the evening of the opening a demonstration of a fireless cooker and electric range was given by Miss Bertha Baughman, who is in charge of the domestic science department of the local high school. Coffee, toast and biscuits were served, and this had a great deal to do with the success of the evening's entertainment.

The accompanying illustrations give a good idea of the arrangement of the store,

Fixture Room, Rush Brothers.

showing in detail the assembly of equipment in the fixture room, and the exhibit arrangements in the general supply store. The other illustration shows at the extreme left the front windows of the general electric supply department, in the center the window display of the fixture room, and at the right the offices of the Citizens Electric Company.

Philadelphia Electric Meeting.

Five hundred electrical men of Philadelphia attended a "get-together" meeting at the Hotel Adelphia roof garden on March 5. The meeting was held under the auspices of the Commercial Branch of the Philadelphia Electric Company Section of the National Electric Light Association. Invitations were sent to the Society for Electrical Development to have staff men present to deliver addresses, and four of its staff responded. In this way the meeting became a co-operative meeting for the Society. It was quite apparent that the affair was a success from every point of view, the Philadelphia contractors, 268 being present, dealers, and central-station employees learning more about the splendid work of the Society, and at the same time having an enjoyable evening.

W. H. Johnson, in his short address, gave the Society and its work a splendid endorsement. W. C. L. Elgin paid tribute to the co-operative work that had been done by the Society. J. M. Wakeman outlined the work of the organization, what it had accomplished for the industry, and spoke of the plans for Electric Week.

George B. Muldaur, H. W. Alexander, and A. J. Edgell also spoke, the last two showing lantern slides.

George B. Muldaur, in charge of the field co-operative work of the Society, told of conditions he had found on his extended trip about the country and of the efforts made to further the co-operation between electrical interests.

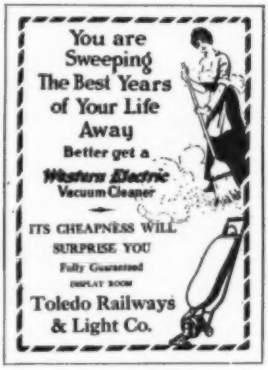
H. W. Alexander, manager of the publicity work of the Society, gave an illustrated talk on what the Society is doing in this line, particularly in helping the smaller central stations and electrical dealers to get more business.

A. J. Edgell gave an illustrated address on store and window displays, showing some of the helps given by the Society to make these displays most effective. The meeting closed with an entertainment.

Jobber Furnishes Special Street-Car Posters to Stimulate Appliance Campaign.

One of the prominent features of the successful washing-machine and vacuum-cleaner campaign conducted by the Toledo Railways & Light Company recently, was the series of ten large attractive street-car posters furnished by the Western Electric Company. Three of the posters are shown in the accompanying illustrations. Their effectiveness is readily apparent.

Five of the posters, which were on the washing machine, appeared in every car in Toledo during the first ten days of the campaign which were devoted to the sale of the washing machines. The posters were changed in the cars every other day.


You are Sweeping The Best Years of Your Life Away
Better get a
Western Electric
Vacuum Cleaner
ITS CHEAPNESS WILL SURPRISE YOU
Fully Guaranteed
Toledo Railways & Light Co.

Street-Car Posters Used at Toledo.

The second ten-day period, on vacuum cleaners, was conducted in the same manner as the first, posters of the vacuum cleaner being changed in the cars every two days.

Co-operative advertising work of this character, conducted jointly by the jobber and retailer, is bound to be productive of the most satisfactory results.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

Annual Report of the Directors to the Stockholders for the Year Ended December 31, 1914.

As an index of business conditions in the United States, this year's report of the American Telephone and Telegraph Company has unusual interest.

Without progress there can be no prosperity is the way President Theodore N. Vail sums up the situation. Telephone business has not suffered as much as other industries, but the growth of the Bell system has been retarded. Therefore Mr. Vail goes back to first causes and in a letter accompanying his report gives a searching analysis of economic conditions, which have put two million people out of employment. This letter is reproduced quite fully on other pages of this issue.

An Epochal Year.

The opening of the transcontinental telephone line, bringing San Francisco within commercial talking distance of the principal cities on the Atlantic seaboard, gives particular interest to the engineering features of the year's report.

"Few can appreciate the years of indefatigable labor on the part of our entire staff and the immense sums of money which this achievement has cost, and fewer still can foresee the countless ways in which it will, from now on, make for the benefit of all the service rendered to the public everywhere. In the Bell system standardization does not mean standing still, but means increasing effort, continually improving and upbuilding. The plant is like a living organism always growing larger and being renewed bit by bit as it grows. Under the intelligent direction of the engineering staff, plant of all kinds costing more than $425,000,000 was added to the Bell system in five years, and plant to the value of more than $175,000,000 was taken out and removed from service. Each year large sums are spent in scientific, engineering experimentation and development work which saves millions to the associated companies and their subscribers.

"One of the year's developments was an underground cable which in its diameter of two and five-eighths inches carries 2,400 telephone wires."

From a legal standpoint the Bell system is in an excellent condition, there being no suit pending against the American Telephone and Telegraph Company or any of the associated companies, charging any violation of any state or federal laws.

Not Profit Sharing.

Welfare work, pension and sick benefit plans are reported to have demonstrated their practical value. During the year benefits were paid in 20,915 cases of disability or death, and at the end of the year 211 former employees were being carried on the pension rolls. The total amount

expended for all classes of benefits was $1,388,261, most of it among the lower salaried employees to whom the loss of wages, even for a short period, would have been a hardship. The recent offer of stock at a low price on installments was intended as an encouragement to saving and over 30,000 employees availed themselves of this offer.

"This has been termed by some 'profit sharing.' It should not be. It is an investment by which the employee becomes also a proprietor, and he occupies the dual relation of proprietor and employee, which if it can be worked out to its fullest possibilities will be ideal."

In this connection it is shown that for each employee there is an average investment in plant of $5,338 which gives a gross revenue per employee of $1,408, of which $656 is distributed in wages, $79 in taxes, $337 in supplies and expenses, $271 as charges for capital and $65 reserved for contingencies.

"It takes an investment of nearly four dollars to earn one dollar in gross revenue. This dollar of gross revenue is divided. Forty-six and one-half cents are paid in wages to employees, five and one-half cents go for taxes and twenty-four cents go for material and other expenses, a very considerable part of which ultimately goes for wages, leaving as a net operating revenue twenty-four cents, of which about twenty cents pays for the use of the four dollar capital invested. The remaining four cents of surplus revenue are actually expended for plant additions, of which about one-half is for wages.

"In any enterprise even of small magnitude, capital is as necessary as are employees. Without capital there can be no employment of workers. Without workers there can be no employment of capital."

The report shows how soundly the Bell system is financed even as compared to government undertakings.

Administration.

An interesting description is given of the development of the Bell organization from the time when electrical science was in its laboratory swaddling clothes and the telephone was called a "Yankee toy" for which no proper financial support could be obtained.

It is show how the local companies were organized and how the need of a common remedy for a common trouble resulted in a central clearing house and finally in the centralized general administration with its enormous economies, its wonderful contributions to the perfection of the art and value of the service, now the premier service of the world.

Control and Regulation.

As far as Mr. Vail can forecast the future, regulation and control by commissions or business courts have become a permanent feature of our economic laws. He points out that these processes could not be perfect from the start, but are being improved.

"It is for the public to combine, to encourage, support and sustain all these courts and commissions and the judges and members of commissions, and above all to abandon condemnation of all conclusions when they differ from selfish desires or opinions based on one-sided and insufficient information. It is for the public to realize that any particular gain, if at the expense of other interests, is no permanent gain at all, that all business or public prosperity is based upon each party to any transaction getting some benefit from it.

"And above all, if there are to be courts of commerce or commissions then the settlement of all mattters which have been referred to such courts by the legislature should be left to them."

Telephone Conditions.

An increase of 515,976 telephone stations has been added to the Bell system during the year, despite the retardation of growth. Also 1,364,583 miles of wire for exchange and toll service were added during the year in the Bell system alone, not including the additions by connecting companies. In traffic the number of messages shows the small gain of slightly over 2 per cent.

"Most of this retardation of growth occurred in the latter half of the year and steps were at once taken to reduce the expenditures for new construction by postpoining such extensions as were not immediately necessary, with the result that the additions to the plant, which at the beginning of the year were estimated to aggregate $56,000,000, were only $50,000,000.

"For the year 1915 it is estimated that current additions to plant will aggregate about $35,000,000 and construction work is now proceeding on that basis. The general business conditions, particularly as they affect the demands for telephone service, are being carefully studied and watched and should they improve, as is hoped, the construction program can be promptly increased to whatever extent it seems justified.

"The gross revenue in 1914 of the Bell system—not including the connected independent companies—was $226,000,000; an increase of over $10,000,000 over last year. Of this, operation consumed $81,400,000; taxes, $12,200,000 or 1.54 per cent on the outstanding capital obligations; current maintenance, $31,600,000; and provision for depreciation, $41,500,000.

"The surplus available for charges, etc., was $50,300,000, of which over $18,900,000 was paid in interest and $30,300,000 was paid in dividends.

"The total capitalization, including inter-company items and duplications but excluding re-acquired securities of the companies of the Bell system, is $1,419,039,668. Of this $624,324,761 is owned and in the treasury of the companies of the Bell system.

"The capital stock, bonds and notes payable outstanding in the hands of the public at the close of the year were $794,714,907.

"If to this be added the current accounts payable, $26,214,274, the total outstanding obligations of every kind were $820,929,181, as against which there were liquid assets, cash and current accounts receivable, of $87,066,862, leaving $733,862,319 as the net permanent capital obligations of the whole system outstanding in the hands of the public.

"As stated in previous reports, we believe from appraisals made by our engineers that the cost of reproduction of the physical plants of the Bell system would exceed their book cost by some $61,000,000, aside from all intangibles.

"The net earnings of the American Telephone and Telegraph Company for the year were $40,557,977.29, approximately the same as in the previous year. The interest charges were $8,223,163.23 and the dividends at the regular rate of 8 per cent per annum were $27,572,674.72. Of the resulting balance there was carried to reserves $2,500,000 and to surplus $2,262,139.34.

"The only change in the outstanding capital stock and bonds of this company during 1914 was the issue of $65,600 par value of stock through the conversion of $86,000 of the 4 per cent convertible bonds of 1906.

"For the $344,681,900 capital stock $369,219,358 has been paid into the treasury of the company; the $24,537,458 in excess of par value represents premiums."

The number of shareholders was 59,415 on December 31, showing an increase of 3,432 during the year.

Although not effective until 1915 mention is made of the plan recently announced, by which employees of two years' service or more in the Bell system are aided to become stockholders of the company to the extent of a limited number of shares each, which they are to pay for out of their wages at the rate of $2.00 per share per month.

In conclusion Mr. Vail says that the position the Bell system holds with the public is entirely due to the fact that the Bell service has been consistently built upon the policy of creating a service of such great benefit and advantage to the public, and rendered at prices so well within its value to all—so well adapted to the use of all, as being a direct pecuniary advantage to each user—that none are too poor to take advantage of it, and none so independent as to get along without it.

To this policy, to this organization, and to every individual member of it belongs the credit of making the Bell system what it is—the premier system of the world and the model after which every universal system throughout the world is built.

Public Service.

A Letter by President Theodore N. Vail, to the Stockholders of the American Telephone and Telegraph Company.

The commentary made herein upon present conditions in public service as it relates to economic and social welfare, is so full of significance and so lucid in its conclusions that it is well worth the careful reading of everyone. Mr. Vail has contributed many valuable utterances heretofore. The contribution herewith is so wholesome in its plain dealing with the facts in the case, and so patriotic in its inspiration and philosophy that it readily becomes a classic in business literature.—The Editors.

Theodore N. Vail has set forth in a letter addressed to the security holders of the American Telephone and Telegraph Company, supplementing his annual report, an abstract of which appears on another page of this issue, his views respecting the general business situation and the course which should be pursued all along the line to effect restoration of common prosperity. While admitting frankly and tersely that "there is a condition of disturbance, of economic unsettlement, which cannot continue indefinitely," he insists that the country was never in better shape basically and adds confidently that only combined effort to inculcate sound ideas and true understanding is requisite to the prompt removal of obstacles which now bar the way to general and permanent revival of business. Although perhaps not optimistic in the strict meaning of the word, Mr. Vail's message is distinctly heartening and breathes positive encouragement with respect to the immediate future.

After pronouncing agriculture, manufacturing and transportation, including intercommunication, the bases of all industries, he sums up the existing situation in these words:

"During the quarter of a century just passed these three principal industries increased about two times and now represent about $100,000,000,000 of invested capital. This development and this new wealth of $65,000,000,000 in these enterprises alone, was made possible by, and was coincident with, the development of transportation.

"The capital invested in Public Service and Manufacturing increased during the quarter of the century at the rate of nearly $1,500,000,000 per year; the number of employed increased about 100 per cent and their yearly compensation over $3,500,000,000 or 130 per cent. In enterprises of transportation and intercommunication the capital increased over $15,000,000,000 or an average of $600,000,000 per year; employees over 175 per cent, with an increase in yearly compensation of $1,350,000,000 or over 200 per cent.

"The normal employment in the public service and manufacturing industries alone should be at the present time nearly if not quite 12,000,000 with annual earnings of from $7,200,000,000 to $7,500,000,000.

"All employment is far below normal. There are fully 2,000,000 unemployed, whose yearly earnings should be at least $1,250,000,000. These unemployed are now living at the expense of their savings, their friends, or the public. If they were employed normal conditions would be restored, the circle of interdependent conditions would be balanced, prosperity would be restored.

"If there could be a restoration of conditions which would inspire confidence in their securities sufficient to command the capital with which to begin the expenditure of even a part of the $1,000,000,000 a year needed to put these enterprises in a position to meet the demands of the country, both as a 'going' and as a 'growing' concern, it would soon restore the normal conditions of employment, expenditure, consumption, production. The circle of industrial conditions would be again balanced, shops and factories would be filled, and instead of the bread line there would be a working line night and morning between places of employment and homes."

How can this be accomplished? Mr. Vail answers:

"The most vital of all present economic problems are the relations between the public and public service utilities, particularly those of interchange and intercourse—What constitutes proper regulation and control—what is the best method of securing their proper maintenance and further extension.

"Movement is life—intercourse and interchange are the basis of civilization and commerce.

"The United States of today, in all its magnificence, has been created—its latent possibilities made tangible, its prosperity maintained, its growth continued—by or because of these means of intercourse and interchange. The maintenance and continued growth of this prosperity will be in a great measure dependent upon the maintenance and continued growth of the utilities which furnish these facilities. All other utilities or industrial or commercial enterprises are subordinate to and dependent upon them.

"It is the generally accepted belief that utliities are dependent on the public, rather than the public dependent on them; while neither could exist without the other, means of intercourse and interchange are the advance agents. Competition, control, regulation and legislation have been looked upon as the causes or forces which have enabled or compelled industrial enterprises to improve and extend their service; to increase production; to pay increased wages and taxes; and at the same time to decrease charges for service rendered. While these have been to some extent a stimulus, the wonderful improvement which has been made has been coincident, and indissolubly connected with the replacement of the old 'rule of thumb' methods, by methods of scientific operation. Investigation research, and the application of the results to both operation and production have produced 'much more' and 'much better' from the same or less effort and expenditure, and have obtained valuable products from what had heretofore been wasted; much to the benefit of the worker, the public served and those responsible for the work. There is a lack of consistency in the understanding respecting enterprise and initiative, and the relations between capital and labor, the employer and the employee. There are many ideals and beautiful theories which in time we hope may be realized.

But commerce and industry are dependent upon the purchaser and consumer, and so long as the human factor of self interests, as it now exists, controls them in their dealings, so long must the effect of that same existing human factor be taken into consideration by commerce and industry in their relations with both producer and the worker.

"Public service enterprises when prosperous are large employers of labor and large purchasers and consumers of all varieties of products and manufactures. Their activity means employment and circulation of money, which in turn means further consumption of products and manufactures, and the further employment of labor. Employment means ability to purchase. Ability to purchase means consumption. Consumption means production, and production for which there is a demand means prosperity. Abundant employment makes the worker his own master. He can afford to purchase and consume production. Without employment he is a burden on his savings, his friends or on the community.

"It is a great revolving circle of civic and industrial conditions, no beginning, no ending. So long as it is unbroken, so long as each condition is balanced by the others, so long as all changes in conditions are allowed to take place by evolution from old to new, or so long as these changes take place with sufficient deliberation to allow other conditions to become adapted to the changes, so long all will go well and there will be peace, prosperity and progress.

"In such times and such conditions everything goes so smoothly that economic life seems commonplace and monotonous; then come the revolutionary changes brought about through those who are too indifferent, careless and unthinking to resist the influence of too radical theorists.

"When the balance is broken by these changes, and the relations between the conditions are changed faster than any adjustment between them can take place, then comes disturbance. Continued disturbance is inevitably followed by disaster.

"To maintain present conditions only, or even obtain actual though not normal increase, does not mean progress, and is not a sound economic position. It is the normal increase that must be had if we are to maintain our relative position and provide for the millions yearly added by new generations and new immigration.

"The entire public, working or investing, should all stand by and uphold a control and regulation which will be thorough and effective, and at the same time equitable, just and practical. But has the public ever remained complaisant when brought face to face with disturbance, uncertainty and unemployment, caused by too drastic action or too radical legislation upon economic conditions or industrial enterprises?

"Regulation and control by commissions or business courts have, so far as anyone can forecast the future, become a permanent feature of our economic laws. Like all new departures from established practice, it could not be perfect from the start. Practice and experience and evolution on the lines pointed out by practice and experience can make perfection. The few years' experience has brought out prominently both good and bad features, but it has demonstrated that there are great possibilities of good and a strong probability, if not a certainty, that there can be had through them, a satisfactory solution of the economic problems, as well as the correction of such business practices, of inherent badness, as were forcing otherwise conservative and right-seeing and right-believing people into the ranks of the extreme radicals. It has demonstrated that if the progress and development of the past are to be maintained, there must be abundant opportunity for individual initiative, as well as individual reward for pioneer work. Too often-repeated investigations and inconsequential hearings waste the time of the officials and the revenues of the corporations. Regulation can be too drastic and interfere too much with operating. Neither economy nor efficiency comes from revolutionary methods.

"Control and Regulation can become destructive instead of constructive; they can by delay paralyze commerce; they can through decrees of inexperienced officials impose unnecessary burdens and unnecessary expenditure upon corporations; they can require too many regulations and theories of operation and too many undeveloped experiments in plant and equipment; they can very easily run into operation. Demands of labor for increased wages and shorter hours, and demands of the public for increased service, must be met by increased revenue, produced by increased rates. The application of scientific and improved methods to operation produced great results in reduction of expenses, because it had an unworked field to start with, but it cannot be expected that the same ratio of progress will be indefinitely maintained. The irreducible minimum in unit expense has been reached in some industries and soon will be in all.

"A corporation, no more than an individual, can be bound hand and foot, and yet be active or give good service.

"Bankrupt public service, in time, means bankrupt communities."

These are axioms which clearly, in Mr. Vail's judgment, should serve as guides to trade and public service commissions composed of the most able and experienced men obtainable. Indeed, he declares emphatically, "until everyone realizes, believes and acts on the belief that no man is too big timber for a court of commerce or public service commission, these courts cannot have their proper position in the mind of the public. If the public can be brought to realize fully that the problems to be solved by these courts are the most vital of all questions, and to the whole public far more vital and important than any of the questions before the higher courts, then and not until then will these business courts have their proper position in the public mind and be esteemed for their true worth.

"It is then for the public to combine to encourage, support and sustain all these courts, commissions and the judges and members of commissions, and above all to abandon condemnation of all conclusions when they differ from selfish desires or opinions based on one-sided and insufficient information. It is for the public to realize that any particular gain, if at the expense of other interests, is no permanent gain at all, that all business or public prosperity is based upon each party to any transaction getting some benefit from it."

Mr. Vail concludes his letter with these words:

"The public mind which has been excited and influenced by exaggerated, misleading and mistaken statements of irregularities, realizes that most of them had no foundation in fact. Those that did exist cannot be repeated; business conscience and public morals, as well as regulatory laws will not permit. Other irregularities will creep in, for where there is abundance produced by labor, there will be many who want a part of it without labor. Take the fetters and restrictions off the employment market, keep a good watch on those who do not want to labor, and punish those who betray confidence. Wealth never will be distributed equally nor always employed wisely, but where it exists in abundance there is always a chance for those who are willing to exchange their labor for some of it."

FIXATION OF ATMOSPHERIC NITROGEN.

Meeting of American Institute of Electrical Engineers and American Electrochemical Society.

The 305th meeting of the American Institute of Electrical Engineers, held in the Engineering Societies' Building, New York City, on the evening of March 12, was a joint meeting with the New York Section of the American Electrochemical Society. It was devoted to a discussion on the fixation of atmospheric nitrogen. President Paul M. Lincoln called the meeting to order at 8:25 p. m. The first paper on this subject was presented by Leland L. Summers. This was followed by a paper by Frank B. Washburn on "The Cyanamid Process". The two papers were discussed together.

General Survey of Present Methods.

The nitrogen contained in the atmosphere is in an inert form and does not readily lend itself to chemical reactions. To overcome this is the province of "nitrogen fixation." There are very definite commercial limitations involved in accomplishing this as the world's supply of nitrogen has been readily obtained from vast natural deposits of sodium nitrate in Peru and Chile and the production of a substitute must be at a competitive cost. There are four methods of fixing atmospheric nitrogen: (1) producing nitric acid directly by the electric arc; (2) using heat of electric furnace to combine nitrogen with such a substance as calcium carbide (giving calcium cyanamid); (3) producing ammonia directly from hydrogen and nitrogen, as in Haber process, where a catalytic agent is used; (4) combination at high temperature produced by combustion. Theoretical considerations indicate most rapid reaction at high temperature, the end product depending also upon the masses of the several compounds present. Thermodynamic equilibrium is considered. Various theories of reaction are explained, and the processes of Birkeland-Eyde, Schonheu, and Pauling, for directly producing nitric acid are described. These electrical processes for fixing nitrogen have a very low efficiency, due to utilizing thermal energy only. Combinations of electrical and chemical methods promise the most important developments, especially the cyanamid process. The Serpek and Haber processes are also considered. Comparative figures are given showing amounts of energy necessary per kilogram of nitrogen fixed, and the general economics of the subject are discussed.

The Cyanamid Process.

Of the four processes which have been commercially considered (Serpek, Haber, arc and cyanamid) the two latter have proved to be commercially practicable and the last named of greatest importance because by it the unit of fixed nitrogen is most cheaply produced. The two processes now produce about 100 tons of fixed nitrogen annually, valued at $25,000,000. The cyanamid process produces about two-thirds of this. Nitrate of soda and sulphate of ammonia constitute 80 per cent of the raw nitrogen products, of which 80 per cent go into agricultural fertilizers. The other principal uses are as nitric acid, ammonia, and in dyes and other chemical compounds. The author then considered the importance of fertilizer in agriculture and proceeded to an economic discussion of the elements entering into its production, with a comparison of methods. The arc process produces primarily nitric acid, the cyanamid process ammonia. The field of application of nitric acid as such is only about one-tenth that of other nitrogen compounds. Considered commercially, the relation of raw materials, availability of power, and market for the products is very important and the conditions for the arc process are not favorable in this regard. Ammonium phosphate was stated to be the most favorable form of fertilizer. The cyanamid process is the best for supplying the necessary ammonia. The expense of producing a unit of nitrogen by this process is as low as that for the power alone or the other costs alone by the arc process and consequently less than half of the total. Even in producing nitric acid the cost of power would have to be brought as low as $4.00 per annum per horsepower for the arc process to be as cheap. The Haber process also involves a cost nearly double that of the cyanamid process. Moreover, the initial investment for a given yearly output is less for the cyanamid process than for either of the others, amounting to about 1.5 times the annual value of product. There is an almost interminable line of derivatives which can be successfully made from cyanamid. Some of these were then discussed, notably ammonia gas and dicyandiamid, which is useful for dyes and explosives. Recently a new process has been developed for oxidizing ammonia to nitric acid at high efficiency. Also, argon gas has been produced in quantities for use in electric lamps.

The discussion was opened by Joseph W. Richards, who emphasized the importance of the new industry and said the papers presented had covered the technical and commercial sides in a most excellent manner. Last summer he visited the plant at Rjukanfos, Norway, which is the largest using the arc process. It utilizes 250,000 horsepower and the product is shipped all over the world. It is thus one of the largest electrochemical industries in the world. A town of 10,000 inhabitants has grown up around the plant in a valley which five years ago contained but five houses.

He referred also to the cyanamid and Serpek processes. The striking thing about all was their great inefficiency from the energy standpoint. At Rjukanfos the efficiency is about 1.4 per cent. The cyanamid process utilizes about 6 per cent. The Serpek process has about the same thermal efficiency, but has not been commercially operative, although about $500,000 have been spent in experimental work with it. This process produces alumina as a by-product. To produce all the alumina at present utilized in the aluminum industry would require the production of only 40,000 tons of nitrogen.

J. L. R. Hayden questioned the propriety of basing the limitations of the arc process upon thermodynamic equilibrium. Both the work of Haber and his own experiments make this very doubtful. The use of arcs of different temperature indicated no direct relation between the concentration of nitrous oxide and the temperature. The order of electrodes with respect to production of nitrous oxide was as follows: iron, titanium, carbon, copper. The order of boiling points is: carbon, titanium, iron, copper. Carbon, which gives the highest arc temperature, is low in effiiciency; while iron and copper, with approximately the same arc temperature, are at the opposite ends of the list. With low-temperature arcs, such as mercury, it is easily possible to get concentrations above those representing thermodynamic equilibrium. He had been led to the conclusion that the production of nitrous oxide by the arc is essentially a dissociation phenomenon. The more rapidly the gases are cooled down to a low temperature, and the lower the initial temperature, the higher the percentage of nitrous oxide obtained.

David B. Rushmore pointed out the relation of civilization to the conservation of fertility in the surface soil.

Charles A. Doremus referred to the early chemical investigations along these lines, which have been brought to light by the book "Chemistry in America" by Edgar F. Smith. Among these is a reference to the manufacture of nitric acid from atmospheric nitrogen in 1802 by Felix Pascalis, using the apparatus of Guyton de Morveau.

F. V. Henshaw referred to the transportation problems which have been mentioned by Mr. Washburn and the desirability of locating a plant on tide water.

Mr. Washburn in reply pointed out that phosphate rock is found in commercial quantities in this country only in two places: Florida and Tennessee. It is cheaper to transport by water from Florida to Canada than by rail to an adjoining state. There is, however, an advantage in concentrating an industry at one point, as is well illustrated in meat packing. The best place to locate a large plant employing water power in immense quantities is in the Mississippi Valley with water transportation to New Orleans. In answer to another question he stated that the relative tonnage involved in making ammonium phosphate is four parts of raw material to one of finished product.

Mr. Summers then closed the discussion. Answering Mr. Rushmore's question as to the action of the electric field, he stated that the temperature effect in producing dissociation is so great that any electrical effect is negligible. The only important element in the arc process is consequently the thermal energy. On the other hand ozone can be made at low temperature.

The meeting was followed by a luncheon and smoker.

New England Question Box Convention.

A very successful spring gathering of New England electrical men occurred at the American House, Boston, March 11 and 12. The convention was conducted in the form of an informal discussion of topics vital to the industry, many of the 300 members present taking part freely. The convention was held under the auspices of the New England Section, National Electric Light Association, the Electric Vehicle Association of America and the Boston Motor Car Club.

Sessions occupied full days Thursday and Friday, with a dinner Thursday evening, at which 250 were present. The occurrence of the Boston Auto Show at the same time gave an added attraction for men coming to Boston from all parts of New England.

President L. D. Gibbs, of the New England Section, opened the first session. He said this was to be the least expensive convention of its size ever held, its cost not exceeding $100. Mr. Gibbs stated that at a meeting of the Executive Committee of the National Association, held recently in New York it was decided that manufacturing interests will be given representation on that committee. The new organization of manufacturers will be for the purpose of enabling them to discuss their peculiar problems by themselves, and at conventions of the N. E. L. A. they will take opportunity to mingle with their customers.

Welles E. Holmes, manager of the Cambridge Electric Light Company, then took charge of proceedings as manager for the day. He spoke of the value of the convention to the young man. The latter should always improve opportunities for self-help, and not depend entirely on his company, he said.

Eugene Carpenter, of the Buzzards Bay and Martha's Vineyard lighting companies, had charge of the question box.

Steam power was the first topic. Mr. Holmes told of the cure of smoke troubles at Cambridge by the installation of Taylor stokers, which had increased boiler capacity and eliminated smoke. The same effect can be brought about in part by proper hand-firing. Feed slowly; three shovelfuls of coal rather than ten at once; watch dumping, to prevent fuel waste, he said.

John Seed, Worcester Electric Light Company, said coal with 20 per cent volatile matter will produce some smoke if forced. If cleaning is done hastily some smoke will result. It is well to take 10 to 15 minutes for this process. Mr. Seed held that the operation of boilers at 150 per cent of nominal capacity was most efficient, but sometimes 200 to 250 per cent is reached.

W. R. Eaton, chief engineer of the Cambridge company, gave 175 to 300 per cent as his practice, superheating coils being installed.

R. W. Rollins, of Worcester, said his company makes a public point of its smokeless chimneys. A member recommended the installation of steam jets under the fuel bed to prevent clinker formation. These are made by perforating a section of pipe, which lasts about a year before renewal.

On the next topic, generators and motors, the question was asked whether there was any objection to the slotting of commutators on 600-volt direct-current interpole motors. Opinion was expressed that this is a feasible method of improving commutation.

Suggestions offered under the general subject were: The posting of a notice of "Don'ts" near the starting switch of all motors, the customer to receipt for the notice. This is aimed at accident prevention to apparatus on the company's three-phase, 550-volt service.

Another: "I had an armature shaft which twisted off one of our hoisting motors. I had it welded, then straightened and turned it down and installed it in truck with a loss of only 2.5 hours."

The general subject of welding was discussed and it was pointed out that care is needed to see that welds are not superficial. A repair to the shaft of a 15-horsepower motor was interesting. The shaft was turned down 0.25 inch and a new bushing shrunk on, giving good service.

The subject of storage batteries was then taken up. The question was asked why central stations often buy distilled water when condensed steam could be used.

A Fall River member said his company used condensed steam. At Lawrence a low-cost distilling apparatus with gas flame is used. In Worcester natural filtered water is used, the water being exceptionally pure. E. W. M. Bailey said a four-inch pipe with a tap on each end and 12 feet of 0.25-inch copper tube would make a distilling apparatus, at a cost of about $10. Live steam from the boiler is passed into it.

C. A. Mixer, of Rumford, Me., bought a standard still, and placed it on an electric hot plate. He understood certain battery companies analyzed local waters to see if they were sufficiently pure to use without resorting to distilled water.

A suggestion for cutting slate or marble switchboards or panels when in position was, to use a high-speed power hack-saw blade, ground like a keyhole saw and clamped in a kerfed wood handle. Near live wires it can be used dry.

The subject of reverse-phase relays on elevators received much attention. David W. Beaman, of New Bedford, thought a customer installing an elevator should install this apparatus, omission of which may lead to trouble. A member suggested the location of the relay just within the service connection. The placing of the apparatus close to the motor has the disadvantage of not disclosing change of phase until the motor is started.

"How can voltage regulation be maintained within three per cent at customers' services on long rural lines with 50 consumers having a connected load of from 5 or 6 lamps each, up to a two-horsepower motor, scattered along the line, without investment in copper that is prohibitive because of the small items?" was asked.

C. R. Hayes, of Fitchburg, Mass., said his company has one General Electric pole-type regulator to counteract the line drop of a 2,200-volt five-mile line. It serves to compensate for line-drop variation in the 24 hours. W. P. Schwabe, of Thompsonville, Conn., said his company had 4 or 5 pole-type regulators, but the Public Utilities Commission objected. The Board of Health of a community caused the removal of one because of excessive noise. On a 10-mile line, a regulator is installed 4 miles out and a transformer giving a 5-volt boost, 7 miles out. At the end of the line is a 15-horsepower motor, which runs a refrigerating plant. Sufficiently good service is maintained at off-peak times. The company has 6 to 14-mile lines, with scattered customers, and there is some difficulty in conforming to the regulating Commission's requirements.

A member company reported that it had two single-phase automatic inductive regulators connected in a two-phase light and power feeder circuit. The motors on the regulators are of a three-phase special high-torque design, and when operated continuously for even a few minutes will heat a great deal. During the day, when the voltage fluctuations are frequent, caused by the power load, these regulator motors heated and caused trouble. This has been eliminated by installing an Anderson low-voltage time switch in the secondaries of the motor operating the regulators and setting it to disconnect the motor during the day.

The charts taken from the circuits show the voltage regulation to be as good during the day without the automatic regulator as with it.

Transformers and Oil Switches.

The following suggestions as to transformers and oil switches were offered: "Some time ago we installed a discarded 50-watt 2,200/110-volt potential transformer on our 220-volt lighting service to supply current for our signal bells and home; it has worked very satisfactorily."

"When no protective devices are installed on constant-current transformers, an alarm bell can be arranged to ring in case of open circuit."

"A potential regulator in an outside transformer house caused trouble by either raising or lowering voltage in jumps or hanging up at its high or low point. The trouble found was that the primary relay was not level and the guides on the solenoid had worn hollow in its bearing and would stick. The relay was leveled and bearing reamed out and trouble overcome."

"In two instances where the customer has reported that the operator received a shock from compensators, we have found that this apparatus was so installed that water was in the oil case, thereby conducting the electricity to the outside metal."

"Enameled conduit is the real thing for oil switch connecting-up. It has the following points: Stiffer, straighter, and needs no painting."

A member pointed out the prevalent neglect of oil switches in customers' services, particularly as to the care of oil therein. Mr. Mixer held that both drying and filtering of oil was needed; his company attends to this in apparatus installed on customers' premises. Mr. Carpenter suggested a tap and cock at the bottom of apparatus, to make a test of oil more readily accessible. Oil and mud settle in the base of the transformer and strata of this could thereby be removed with readiness.

The Boston Edison Company reported that it tests and filters transformer oil in its own apparatus, but not in consumers'.

Mr. Hayes, Fitchburg, asked if any company had a regular policy as to inspecting oil levels in transformers. Mr. Holmes, Cambridge, stated that his company does this regularly in summer.

Mr. Sawyer, of Salem, said his company makes a regular yearly inspection of line transformers, testing for grounds, contacts and oil level. All low-level units are filled. If any ground is discovered, secondary leads are run to see if the trouble is in the transformer or in the customer's lead. All new secondaries now being installed are being thoroughly grounded.

C. B. Burleigh, Boston, said companies might well investigate oil in compensators and switches on customer's premises, though trouble seldom results.

In Cambridge a regular inspection of 550-volt three-phase motor service is made on the principle of safety.

Mr. Carpenter: "See that oil is properly supplied to apparatus early in the spring, to safeguard against summer lightning."

Employees.

On the subject of the employee, Mr. Gibbs told of the value of company sections. He held that the central station should not pay employees' dues in the N. E. L. A.; each man ought to boost for himself.

Suggestions bearing on the employee were:

One company offers a monthly first and second premium to any employee reporting conditions that might cause injury to employees or the public, or cause loss or waste.

Let employees use a memorandum sheet for the recording of details pertaining to their work.

Employees' identification cards, bearing the employee's photograph and signature, and that of the manager, are better than metal badges.

Advice to employees: Always present a neat appearance; rely on yourself, don't depend on information checked up by others; check up order of suites in apartment houses.

Improvement of service is often brought about by co-operating with employees, and educational work through an Employees' Club. The Blackstone Valley Gas & Electric Company, Woonsocket, R. I., has done much along these lines. The manager, A. F. Townsend, said: "The biggest and most vital question today is service. A company is judged by the quality of the service it renders; most of its problems are related to it. Its basis is the employee, and on him depends the quality of service rendered. If an improvement in service is to be effected it must come through the employee. To this end we have our Employees' Club, now in its fourth year. We feel that our service has been greatly improved, especially during the past season, inasmuch as we have made an active attempt to better our service. We worked on the theory that service, like the individual, never remains motionless."

The company publishes a "Service Code," which has been discussed in the club meetings. Talks on phases of the business have been with good effect. Social aspects of club life are fostered, and suppers, entertainments and Christmas festivities held. At the latter the entire families of employees were present.

Out of 70 employees released from evening duty, an average of 40 and a maximum of 68 employees have attended the meetings.

At Plymouth, Mass., an employees' club has recently been formed, the object being for all to become acquainted and gain an *esprit de corps* for the work.

The territory of the Buzzards Bay companies is in four divisions. Bimonthly meetings of superintendents and employees are held, when problems of mutual interest are discussed.

Thursday Afternoon Session.

The afternoon session opened with accounting as the topic. The question was asked how prepayment meters were treated in summer when customers are away. One member company regularly bills the customer at the minimum price per month.

Is $25 income on $100 invested a safe allowance in figuring extensions? F. J. Lyon, Waterbury, Conn., gave the following as a proper basis of figuring: Take the cost of the extension and add 17 per cent for overhead and supervision; allow 15 per cent on the amount (6 per cent interest and 9 per cent depreciation), then multiply by two, to cover operating expenses, which may be reckoned at 50 per cent of gross income. The result is $35 on the $100 of investment.

Mr. Hayes pointed out that lighting and power extensions must be considered on a different basis. Mr. Schwabe said the ratio of 33 per cent was an old-established one, but the ratio must be increased as rates are reduced. A member stated that his directors wished extensions made when a return of 10 per cent was in sight, but this was entirely impracticable, he thought.

On the subject of requiring a deposit from small residence customers before connecting service, it was generally agreed that it is better policy not to require a deposit but to learn the customer's reliability and follow up his account closely. L. D. Gibbs suggested co-operating with the telephone company in securing customers' credits, thus saving duplication of effort. When an applicant for service calls by telephone, let the central station's credit man call up the telephone credit department, and if the latter is going ahead in installing service the lighting company may properly do so without further investigation. Department-store credits, and the records of lighting companies in cities from which the applicants came, may also be utilized. Connect the customer with a minimum of red tape, said one speaker.

A member reported the practice re-

cently adopted by the Central Massachusetts, Ware and North Brookfield Companies in securing the payment of back bills by delinquent customers. Prepayment meters are installed, set for a 25-cent rate per kilowatt-hour. This assures the company of prompt payment of monthly current bills and as the net rate is 15 cents, 10 cents per kilowatt-hour is credited to the customer and applied on the back bill, which after a few months is wiped out.

Attention was called to the new Westinghouse prepayment meter which is so constructed as to enable change of rates to be made in a half minute. The added first cost of the apparatus is compensated for by the fact that all bills for the current month are paid promptly and a sure way of squaring all overdue bills without expense for collection is provided.

The Narragansett Company reported its practice of giving rewards for perfect meter reading. For perfect reading $10 a month is given, and as many as seven readers have received this premium in a month.

On the subject of installing meters, one company installs the same day, the meterman securing the written application in cases where the applicant calls by telephone. Another company requires 48 hours' notice, but connects more promptly if asked for.

It was reported that certain companies are making the practice of laying out wiring jobs for both light and power installations. Another company installs motors free of charge.

A suggestion for the economical handling of stock was as follows. With the short eight-hour working day, it is required that the stockkeeper bring the automobile delivery cars to the stock-room door before regular working hours in the morning and at noon, and lay out the material, such as lamps and meters, for the drivers, so that they may begin their outside duties promptly. Furthermore, it is required that a slip be given to the order man for replenishments of lamp stock required on the regular automobiles, so that this also may be ready for loading without delay.

A member of the Boston Edison Company Section pointed out the advantages of having one man do all the figuring on prospective installations. Solicitors of new business, who usually do this work, are apt to leave the company before the contract is finally secured, and then their figures are unintelligible to their successors. Now, this one man accompanies the solicitor, views the premises and makes his figures on standard forms. In a small company the manager could do this himself. In Providence, R. I., the company files the daily report and records of power solicitors, and these are accessible for future reference.

The Cambridge Electric Light Company offered this scheme, which it has adopted. Have a metal label bearing the words "Property of the C. E. L. Co." and a serial number, riveted on all apparatus such as time clocks, transformers, etc., which are located on customers' premises. Each piece of apparatus has a record card in the office which states what it is and where located.

Lighting and Lamp Renewals.

A long discussion of lighting service brought out some strong advocacy of gas-filled lamps for street illumination. Cambridge has 20-ampere, 1,000-candlepower lamps of this type in service, and finds them cheaper to operate and as satisfactory as arc lamps. Waterville, Me., has recently displaced arc lamps with 600-candlepower gas-filled units. They are operated from arc-lamp machines, in series sockets with reflector and protecting hood attached on goosenecks. Worcester is operating 100-candlepower, 4-ampere street lamps in connection with arcs, operating from constant-current transformers. Trouble was experienced on rectified circuits in connection with arcs.

On the vexed subject of free lamp renewals, members urged that companies should give up the practice. The company at Keene, N. H., ceased to renew several years ago. It offers local supply stores the advantages in price gained under its wholesale contract and thus keeps a line on lamps sold in the town. Mr. Stevens, of Lynn, Mass., stated that his company has always renewed carbon lamps free and now renews 150 to 60-watt Mazdas. E. A. Barrows, of the Narragansett Company, Providence, R. I., said carbons are renewed free, but large customers provide their own lamps. The company recently investigated the cost of supplying large customers with lamps, and found it would cost 1.5 to 2.5 cents per kilowatt-hour, or as high as 33 per cent of income.

Mr. Hunt, of the Manchester (N. H.) central station, pointed out the advantages of non-renewal, the control of output by contractors and the sale of Mazdas at a small profit, this being the practice with his company.

One member company gives these hints to its meter readers: read all dials; report all meters with red tags attached; give no readings to tenants who have special meters, refer them to the landlord; figure no bills for customers; report meters not sealed; keep pickups clean; take no lamp orders, refer customers to office; report new services; report wires running to building for which you have no red card; place new cards in position most convenient for reading; report peculiar conditions about wiring, and if not understood ask about it.

Another company has this plan for securing meter reading "pickups" promptly: the reader leaves a return addressed postcard with form on reverse to be filled by the customer, for the man to return and secure the reading at a convenient time noted. Every effort is made to secure keys to churches, stables, and other buildings not regularly open; these are numbered with a metal tag so that if lost the finder will be unable to use them.

Meter complaints can be handled to advantage by installing a second or checking meter, as this method will show incorrect clock gear ratios. The rotating standard is extensively employed, one company using a portable load on lighting meters, the meter being tested at full rating and at 5 per cent, as well as at the customer's normal operating load. On power meters the customer's normal load is used.

A great saving of time could be made, said a member, if each meter installer, when removing a meter from an apartment house, would mark the loop with the suite number and place his initials thereon, to fix responsibility in case of any error.

On the subject of slow accounts, Mr. Lyon, of Waterbury, Conn., outlined a plan which provides for three separate notices at 10-day intervals, and at the end of 80 days after date of bill a man with cutout notice is sent. He is not permitted to receive money, the customer being required to appear at the office with payment. The Fitchburg company charges $1.00 for shutting off and re-connecting service. A blacklist has been kept, resulting in few meter removals.

Methods of handling details of office work are: at Fitchburg all collections, including checks, go through a cash register; the Waterbury company issues its bills on postcards, without meter readings, the commission not requiring this. It was stated that post-office regulations allow bills on postcards if no threat is printed or written.

Mr. Schwabe said the keeping of the history of every street lamp is worth while; in one instance it paid for the cost of the system during several years by establishing facts in a claim on the lamp company.

The subject of transmission lines was next taken up. A Massachusetts company reported its experience in transmission-line construction. It has been using both the bow-arrow and wishbone types, and finds a considerable saving on lines of either high tension or 2,300 volts, the extra strength of the arm permitting spacing poles from 200 to 250 feet apart. Though the cost

of the arms and pins is almost 2.5 times that of wooden cross-arms and pins, the distance on which poles may be placed reduces the cost about $225 per mile, using 40-foot poles.

The same company has used Peirce specialties for connecting customers, and running secondaries along the street, with satisfactory results. Though the first cost is more, the low maintenance cost more than compensates for the added outlay over that for wooden construction, it was stated.

Synchronous Condensers.

The value of synchronous condensers was the subject of protracted discussion. The Hartford Electric Light Company has four machines in service, one of 200 kilovolt-amperes at the end of a 10-mile 10,000-volt transmission line, driving a load of 75 horsepower. Another is installed in a factory where the load is induction motors, and a third in a typewriter works, where it has accomplished so marked an improvement of voltage as to have saved the expense of the apparatus. The fourth installation is a 150-kilowatt motor-generator running variable-speed motors. In two instances the company pays a factory attendant a small sum weekly to start and stop the apparatus and keep it clean. In one of the factory installations the power-factor has been increased from 75 to 85 per cent, and on the 10-mile line a factor of 91 per cent is obtained between 7 a. m. and 6 p. m.

Another member stated that the installation of a 125-kilovolt-ampere, 2,300-volt synchronous condenser connected with a 40-horsepower load had improved the factor from 55 to 92 per cent.

At Plymouth, Mass., a 300-kilovolt-ampere unit has been installed at the end of a 20-mile line, a 60-per-cent power-factor being increased to 80 per cent. This is operated with a Tirrill regulator. A 100-kilowatt condenser at the generating station corrects the power-factor there, giving 80 to 85 per cent. Both are 2,300-volt machines.

At Cambridge a machine has just been installed to correct the power-factor on a 3,300-kilowatt load, the increase being from 70 to 87 per cent.

A suggestion for the placing of Lundin cutouts so water will not leak in, was to place them inside the pole, with a cast-iron door. This is the practice in Worcester, Mass.

An excellent suggestion for the making of a map of pole lines was offered by Mr. Carpenter. Government geodetic survey maps are procured, and enlarged several fold. Accurate tracings of the line are made upon these sheets which are arranged in sections of territory 10 miles square.

(To be continued.)

Symposium on Operating Results of Steam-Railroad Electrifications.

On the evening of March 16 a meeting was held by the Western Society of Engineers at its headquarters in Chicago, Ill., at which a series of papers dealing with the operating results of the electrification of steam railroads was presented. President William B. Jackson presided.

The first paper was presented by George Gibbs, consulting engineer of the Norfolk & Western and the Pennsylvania railways. Mr. Gibbs took up first the electrification of the former system, which was put into complete operation about four weeks ago. The Norfolk & Western is a great coal-carrying road of the total length of 375 miles, running over three mountain summits. The very heavy tonnage hauled, together with the marked competition of other coal carriers, compelled the use of very heavy trains, hauled by the most powerful steam locomotives ever built. The most difficult section was about 30 miles in length, known as the Elkhorn Grade. This had heavy grades and included one tunnel and a gathering section. This is the division that has been electrified. It was customary to haul trains of as high as 3,250 tons by means of three Mallet steam locomotives. The maximum speed attained was seven miles per hour.

After carefully studying the situation, it was decided to electrify this section with a single-phase overhead catenary trolley line carrying 11,000 volts. The locomotives are built on the unqiue plan of having a phase converter which changes the single-phase supply, after its voltage has been stepped down, to two-phase current, which is then changed to three phase by means of Scott-connected transformers. The propelling motors are three-phase motors, which are the most rugged type for heavy service. Each locomotive, of which there are now 12 in service, is 270 tons in total weight and develops a guaranteed tractive effort of 133,000 pounds; considerable more than this has been actually developed in service. During acceleration 11,000 horsepower is developed on one train and 8,000 horsepower in regular running. The speed is practically constant at 14 miles per hour. On down grades this rises to about 14.75 miles, but does not exceed this, because electric regenerative braking keeps the train from attaining higher speed without applying air brakes at all and returns as high as 2,000 kilowatts to the line.

Mr. Gibbs then described the electrification of about 20 miles of the Pennsylvania Railroad's main line running west from the Broad Street Station in Philadelphia to Paoli. This is a four-track section which has been equipped with 11,000-volt, single-phase, overhead catenary trolley. The need for this electrification arose from the increasing congestion and lack of capacity at the Broad Street terminal. At present only suburban service is electrified, but it will reduce station movements very greatly and give from 17 to 19 per cent relief to the congestion. All of the overhead construction is of bronze wires and cables except the messenger wires. No span bridges are used, but the cross spans are made up of a cross catenary. Construction work was carried on in an ingenious manner without interfering with the heavy traffic on this important section. The present equipment, which has just been put in operation, consists of 93 multiple-unit motor cars. Each car carries two 225-horsepower, single-phase motors mounted on one truck. These cars are steel passenger cars. All current is purchased from the Philadelphia Electric Company.

Edwin B. Katte, chief engineer of electric traction, New York Central Lines, spoke of the results obtained in the New York City terminal electrification. He said that the element of cost is a very important feature in electrification. The first cost of a steam locomotive of modern type is about $25,000, whereas the first cost of an electric locomotive of similar capacity may be $45,000; on adding the cost of power house, transmission, substation and working-conductor equipment, the total electrical equipment cost may rise as high as $110,000 per locomotive. This heavy investment can be justified only when decided economies result. The New York City service is peculiar and, at the present time at least, is not adapted to permit attaining the highest possible economy from electric operation. If the length of line were greater, the operating economies would be more marked. Mr. Katte gave the results obtained during the past eight years, citing many detailed figures on maintenance of the various classes of equipment, in which that of the third rail is found to be rather heavy. He also showed the relatively small amount of train detentions attributable to electric operation.

A paper by W. S. Murray, consulting engineer of the New York, New Haven & Hartford Railroad, was presented, in the absence of the author, by Elmer T. Howson. The New Haven electrification now involves 73 miles of line from the New York City terminal to New Haven, Conn. The results obtained in power consumption for various classes of traffic were given. Records have been kept in very minute

form, giving the energy consumption of each locomotive, which have proven of great value in studying the operation. In coal consumption since electrification has been completed, there has been achieved an economy of something like 50 per cent. Mr. Murray believed that the greatest economies will result from through-freight movements. Double-heading of trains increases the capacity of the road very greatly. A proposed increase in power equipment at the New Haven end will produce very marked additional economies. If the high-speed passenger traffic of this road, which is very heavy, formed a smaller percentage of the total traffic, it would be possible to increase the weight of freight trains hauled at somewhat lower speed, and thus achieve further economy.

A car equipped with metal-contained mercury-arc rectifier, which changes the single-phase supply to direct current for the driving motors, has been tried out on the New Haven line with much promise of complete success. Such an equipment, if provided for all of the locomotives and multiple-unit cars, would increase the motor capacity of this system about 25 per cent over what it is now with single-phase motor equipment, and this without any change in the power house or overhead equipment. Mr. Murray's paper was concluded with some suggestions on slight changes necessary in railroad administration to secure the best results from electric operation.

The last paper of the evening was that of C. A. Goodnow, assistant to the president of the Chicago, Milwaukee & St. Paul Railway; in the absence of the author, this paper was read by E. H. Lee. The project undertaken on the Puget Sound System of this railroad of electrifying about 440 miles from Harlowton, Mont., to Avery, Idaho, was briefly described. Three mountain ranges are included in this stretch. Practically all the traffic is through traffic. This is the first trunk-line electrification which would involve a complete engine division. It was decided to use 3,000-volt direct current on a catenary overhead trolley. It is expected to use electric braking on down grades. The first section of this electrification is to be completed this year, and the entire 440 miles by January, 1918. If the results attained warrant, the electrification may ultimately be extended to the Pacific Coast. All of the power will be purchased. The most marked economy that probably will be achieved from this electrification of four engine divisions is in wages of employees. Greater speed and capacity on the single-track mountain section will also be attained.

A film of motion pictures, showing the electrified line of the Butte, Aconda & Pacific Railroad, and of scenes along the line, was then shown, the film having been kindly loaned by the General Electric Company.

A general discussion was opened by E. H. Lee, chief engineer of the Chicago & Western Indiana Railway. As a steam-railroad engineer, he conceded that electrification of trunk lines is steadily advancing. However, the matter of determining whether electrification shall be adopted or not, must depend almost entirely on the density of traffic on the line; in exceptional cases, such as where tunnels or heavy mountain grades are involved, other conditions may bring about electrification. In general, however, it will be found practicable only where ultimate economy warrants.

Jesse Holdom, chairman of the commission which has been making a study for the past four years of the question of abatement of locomotive smoke and electrification of the railroad terminals of Chicago, made a brief address on the work of this commission. Judge Holdom believed that all large terminals would be electrified, without question, if first cost were not so great.

Chief Engineer Churchill, of the Norfolk & Western Railway, spoke of some other features of this electrification not already touched on. The first studies as to the feasibility of electrification of this line were undertaken in 1905, but abandoned at that time because no economies were then apparent. The total freight tonnage moved over this line per day amounts to nearly 60,000 tons. The principal benefits to be derived from electrifying this line are in the large increase in capacity attainable. Formerly 33 Mallet steam locomotives were in service on the 30 miles now served by 11 electric locomotives. The highest speed formerly attained was 7 miles per hour, but now it is uniformly about 14 miles. Many serious losses that formerly were necessitated by layovers at intermediate points have been eliminated.

W. F. M. Goss, chief engineer of the electrification commission studying the Chicago problem, spoke briefly of the long investigation undertaken and the great magnitude of this problem. The report of this commission is now in the hands of the printer and will soon be made public. If the Chicago railroad terminals, including a total of about 4,000 miles of trackage, were entirely electrified, the problem would be a greater one than has been involved in the electrification of all of the steam trunk lines as yet attained.

James C. Mott described briefly the electrification of the Detroit River tunnel of the Michigan Central Railway. This is almost exclusively a terminal proposition and operation has been very successful.

E. M. Herr, president of the Westinghouse Electric & Manufacturing Company, said that each electrification project must be carefully considered on its merits and on the conditions involved, else electrical equipment is very likely to be misapplied. There is very evident a decided trend toward trunk-line electrification. Mr. Herr referred to the case of one of his former railroad associates, who had been convinced that the electrification of mountain divisions was more practical in achieving increase in capacity and economy of operation than very heavy expenditures involved in reducing mountain grades.

Bion J. Arnold closed the discussion by relating some reminiscences of the preliminary studies of the New York Central electrification. No data were available at the time as to what operating results would be achieved. He touched on the other elements usually brought into an electrification problem, such as rearrangement of trackage or terminal, which greatly complicates the situation. This is particularly true in Chicago, where, if terminal rearrangement could be carried out, the cost of electrification would be very decidedly reduced.

Telephone Pioneers Will Meet in San Francisco.

The fifth annual meeting of the Telephone Pioneers of America will be held in San Francisco, Tuesday, September 21, Wednesday, September 22, and Thursday, September 23, during the Panama-Pacific International Exposition.

The following were appointed a Committee of Arrangements with authority to appoint the necessary sub-committees: George E. McFarland, president of the Pacific Telephone and Telegraph Company, San Francisco; A. S. Hibbard, American Telephone and Telegraph Company, Chicago; Gerard Swope, vice-president and general manager of the Western Electric Company, New York City.

Arrangements are being made for a Pioneer special train between New York, Boston and other eastern cities, via Buffalo, Chicago, Omaha, Denver, Colorado Springs, Salt Lake City, Los Angeles and San Francisco, returning via Portland, Seattle and the northern route.

Color To Be Discussed at Chicago.

At the meeting of the Chicago Section, Illuminating Engineering Society, on March 25, a paper will be presented by M. Luckiesh, of National Lamp Works, Cleveland, O., on "What We Know About Color." Everyone interested in this subject is invited to attend.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 28.

A 25-horsepower, 230-volt shunt motor takes a current of 8.3 amperes from the line at no load and runs at a speed of 1,200 revolutions per minute when the field current is 2.5 amperes. The air-gap flux for any magnitude of field current is given in Fig. 25 (see page 544); curve A being for an armature current of 5.8 amperes and curve B for an armature current of 90 amperes. The armature resistance (hot) between brushes is 0.12 ohm. The resistance of the field winding (cold) is 65.0 ohms; (hot) 76.6 ohms. An adjustable rheostat is connected in series with the shunt field winding.

With the field winding hot in each case find the armature speed under the following conditions: (*a*) terminal voltage, 230 volts; armature current, 5.8 amperes; field-rheostat resistance, 32.4 ohms (this same resistance (cold) is 27.0 ohms); (*b*) terminal voltage, 230 volts; armature current, 90 amperes; field-rheostat resistance, 32.4 ohms; (*c*) terminal voltage, 230 volts; armature current, 5.8 amperes; resistance of field circuit, 76.6 ohms; (*d*) terminal voltage, 230 volts; armature current, 90 amperes; resistance of field circuit, 76.6 ohms; (*e*) terminal voltage, 230 volts; armature current, 90 amperes; resistance of field circuit, 220 ohms; (*f*) terminal voltage, 235 volts; armature current, 90 amperes; resistance of field circuit, 220 ohms; (*g*) terminal voltage, 235 volts; armature current, 90 amperes; resistance of field circuit, 76.6 ohms.

SOLUTION OF PROBLEM 28.

Answer to Question a.

The armature current at no load by [13] is

$$I_a=8.3-2.5=5.8 \text{ amperes.}$$

The armature voltage by [3] is then

$$E_a=230-5.8\times0.12=229.3 \text{ volts.}$$

Substituting in [45] as explained in the Solution of Problem 27,

$1{,}200=229.3K/5.8$ and K equals 30.4

Under the conditions of Question (*a*) the resistance of the field circuit (hot) equals 76.6+32.4 or 109.0 ohms. The field current by [6] equals 230/109.0 or 2.11 amperes. The air-gap flux corresponding to 2.11 amperes in Curve A, Fig. 25, is 5.5 megalines. The speed is then given by [45].

$$S=30.4\times229.3/5.5=1{,}267 \text{ revolutions per minute.}$$

It should be noted that this rise in speed may be entirely due to the heating of the shunt-field circuit. The resistance of the same shunt-field circuit (cold) is 65.0+27.0 or 92.0 ohms. When cold the field current is then 230/92.0 or 2.5 amperes. The air-gap flux corresponding to this shunt-field current (Fig. 25, curve A) is 5.8 megalines. The speed with the field circuit cold is by [45]

$$S=30.4\times229.3/5.8=1{,}200 \text{ revolutions per minute.}$$

The heating of the shunt-field circuit may then increase the no-load speed under the above conditions by 5.6 per cent.

Answer to Question b.

The armature voltage by [3] is

$$E_a=230-90\times0.12=219.2 \text{ volts.}$$

The shunt-field current as before is 2.11 amperes and the corresponding air-gap flux (Fig. 25, curve B) is 5.25 megalines. The speed is then given by [45]

$$S=30.4\times219.2/5.25=1{,}269 \text{ revolutions per minute.}$$

If the field circuit had been cold the speed would have been 1,169 revolutions per minute (see answer to Question (*a*), Problem 27). At full-load the heating of the field circuit may then increase the speed under the above conditions by 8.6 per cent.

Answer to Question c.

With no resistance connected in series with the shunt-field winding the resistance of the shunt-field circuit is 76.6 ohms and the shunt-field current is 230/76.6 or 3.0 amperes. The corresponding air-gap flux is then 6.05 megalines. The speed is given by [45]

$$S=30.4\times229.3/6.05=1{,}151 \text{ revolutions per minute.}$$

Answer to Question d.

The field current as before is 3.0 amperes, but the air-gap flux is slightly less (Curve B, instead of Curve A) and equals 5.98 megalines. The armature voltage by [3] is

$$E_a=230-90\times0.12=219.2 \text{ volts.}$$

The speed is given by [45]

$$S=30.4\times219.2/5.98=1{,}113 \text{ revolutions per minute.}$$

Answer to Question e.

The field current by [6] equals 230/220, or 1.045 amperes. The corresponding air-gap flux is 2.5 megalines. The armature voltage being 219.2 volts, the speed is given by [45]

$$S=30.4\times219.2/2.5=2{,}665 \text{ revolutions per minute.}$$

Answer to Question f.

The field current by [6] equals 235/220, or 1.068 amperes. The corresponding air-gap flux is 2.55 megalines. The armature voltage by [3] is

$$E_a=235-90\times0.12=224.2 \text{ volts.}$$

The speed is given by [45]

$$S=30.4\times224.2/2.55=2{,}673 \text{ revolutions per minute.}$$

It should be noted with reference to the results obtained in the two preceding cases that it may be impossible, or at least dangerous, to run the motor at the speeds obtained because of the high centrifugal stresses produced in the armature, commutator, pulley, etc.

Answer to Question g.

The field current by [6] is 235/76.6, or 3.07 amperes. The corresponding air-gap flux is 6.0 megalines. The armature voltage as before is 224.2 volts and the speed is given by [45]

$$S=30.4\times224.2/6.0=1{,}135 \text{ revolutions per minute.}$$

The reader should not expect to obtain results as precise as those given, as the scale of the curves in Fig. 25 does not permit such precision.

An examination of the above results reveals the following facts regarding the shunt motor operated with a variable field current:

(1) With a constant terminal voltage the speed increases as the resistance of the shunt-field circuit increases. This is the usual method employed for adjusting the speed of a shunt motor. It should be noted, however, that when the field is saturated, changes of field-circuit resistance produce only slight changes in speed, while at low saturation the same percentage changes in field-circuit resistance produce marked changes in speed. In the answers to Questions (*a*) and (*b*) it was also shown that changes in speed may also occur by reason of temperature changes in the field winding and field rheostat.

(2) After the speed has been adjusted for any load by changing the resistance of the shunt-field circuit, variations in

ALTERNATING CURRENTS.

Problem 78.

A three-phase, 25-cycle, 2,200-volt induction motor is rated to deliver 500 horsepower at full load. The ratio of transformation[1] is 2,200:615. At no load the motor takes 13.5 kilowatts and a line current of 39.8 amperes from a 2,200-volt circuit. With the rotor blocked the power is 117 kilowatts and the line current is 289 amperes when the impressed line voltage is 760 volts. In both of these tests the temperature is 25 degrees centigrade. At this temperature the resistance between terminals is 0.356 ohm for the stator and 0.0285 ohm for the rotor. Assume that the ratio of effective to true resistance at 25 degrees centigrade is the same for the stator as for the rotor, and that the leakage reactances of the two windings are equal when reduced to the same side.

(*a*) What are the no-load power-factor, and the equivalent single-phase no-load current? (*b*) What are the equivalent single-phase true resistances of the stator and rotor windings at 25 degrees centigrade? (*c*) What is the equivalent single-phase true resistance of the rotor at 25 degrees centigrade referred to the stator? (*d*) What is the equivalent single-phase effective resistance of the stator at 75 degrees centigrade? (*e*) What is the equivalent single-phase true resistance of the rotor at 75 degrees centigrade? (*f*) What are the equivalent single-phase leakage reactances of the stator and rotor windings? In the last two questions calculate the rotor constants referred to the stator.

1 The ratio of transformation is the ratio of the terminal voltage of the stator and rotor at standstill before the latter is short-circuited.

load do not produce the wide fluctuations in speed which are characteristic of speed adjustment by changing the resistance of the armature circuit.

(3) If the resistance of the field circuit is fixed, variations in terminal voltage produce greater changes in speed when the field is saturated than when unsaturated. The results obtained, for example, show that for a 2.17-per-cent increase of terminal voltage with the field saturated the speed increases 2 per cent, while with the field unsaturated the speed increases only 0.3 per cent. This indicates that when the line voltage is fluctuating and constant speed is desirable, shunt motors should be operated with unsaturated fields.

SOLUTION TO PROBLEM 78.

Answer to Question a.

The performance of an induction motor is rather more difficult to calculate than that of a synchronous generator or motor. In some respects its behavior is like that of a transformer. Each has primary and secondary windings, which in the motor are also called the stator and rotor windings. Electrical power can be taken from the secondary winding of the transformer because of the induced voltage that is produced in it. In the motor the rotor winding is usually short-circuited, although sometimes, as we shall see, it is closed through a resistance. Due to the interaction between the currents in the stator and rotor windings the latter will rotate if allowed to do so. This rotation of the rotor produces an induced voltage in it which corresponds to the terminal voltage on the secondary side of the transformer. Whenever an induced voltage is due to rotation mechanical power is developed.

Just as in the case of the transformer, it is important to have data taken at short-circuit and open circuit. The former consists of the measured current, voltage and power input to the stator winding when the rotor is prevented from turning. The latter consists of the same measurements taken when rotor is turning over freely against its own friction loss. In the case of the motor it is necessary to separate the equivalent resistance and reactance into the parts that are due to the stator and rotor windings and it is very important to know the value of the true resistance of the rotor winding as closely as possible. In the transformer the no-load current is negligible, but in the motor it is sometimes as great as one-third of the full-load current. This is on account of the air gap in the magnetic circuit. The best method is to reduce all constants to their equivalent single-phase values. The equivalent single-phase voltage is the actual line voltage. The equivalent single-phase current is the line current multiplied by the square root of three. The equivalent single-phase resistances and reactances are the values between terminals divided by two. See formulas [34a] and [35a].

By [42a] $PF=13{,}500/\sqrt{3}\times 39.8\times 2{,}200$
$=0.089.$

The equivalent single-phase current is
$\sqrt{3}\times 39.8=69$ amperes.

Answer to Question b.

The equivalent single-phase resistance of the stator winding at 25 degrees centigrade is

$0.356/2=0.178$ ohm.

The corresponding rotor resistance is

$0.0285/2=0.0143$ ohm.

Answer to Question c.

The resistance of the rotor winding referred to the stator is its actual resistance multiplied by the square of the ratio of transformation. In this case it is

$r_2=0.0143\times(2{,}200/615)^2$
$=0.183$ ohm.

Usually the values of the stator and rotor resistances are about equal when referred to the same side.

Answer to Question d.

The effective resistances are obtained from the short-circuit or blocked data as was done in the case of the transformer. The combined effective resistance of both stator and rotor is by [4a]

$R=117{,}000/(289\times\sqrt{3})^2$
$=0.467$

$(289\times\sqrt{3})$ is the equivalent single-phase current. This value of R is for 25 degrees centigrade. Let K represent the ratio of effective to true resistance at 25 degrees. Then the effective resistances of the stator and rotor at this temperature are $K\times 0.178$ and $K\times 0.183$, both referred to the stator. So we may write that their sum equals their combined effective resistance as measured.

$K\times 0.178+K\times 0.183=0.467$
$K=1.29.$

The effective resistance of the stator at 25 degrees is

$1.29\times 0.178=0.230.$

The effective resistance, or the resistance to alternating current, is thus 0.230 —0.178, or 0.052 ohm greater than the resistance to direct current. This increase in the resistance varies with the frequency of the alternating current, but not with the temperature of the winding. The true resistance, however, does vary with the temperature and at 75 degrees centigrade it is

$0.178\times[1+(75-25)/(234.5+25)]=$
0.212 ohm.

The effective resistance at this temperature is the true resistance plus the constant difference between the effective and true resistances and is

$r_1=0.212+0.052$
$=0.264$ ohm.

This is the value of the stator resistance that should be used in all calculations if the temperature is 75 degrees. It is the equivalent single-phase resistance of the winding.

Answer to Question e.

The true resistance of the rotor winding at 75 degrees, referred to stator, is

DIRECT CURRENTS.

Problem 29.

A 25-horsepower, 230-volt shunt motor takes a current of 8.3 amperes from the line at no load and runs at a speed of 1,200 revolutions per minute when the field current is 2.5 amperes. The air-gap flux for any magnitude of field current is given in Fig. 25; curve A being for an armature current of 5.8 amperes and curve B being for an armature current of 90 amperes. The resistance (hot) of the armature between brushes is 0.12 ohm and the maximum current which the armature will carry continuously without overheating is 90 amperes.

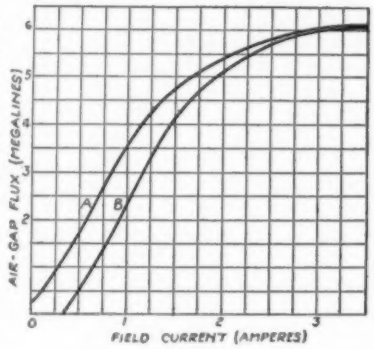


Fig. 25.

The terminal voltage being maintained constant at 230 volts throughout, find the maximum current-flux torque and the maximum gross-power output of the motor under the following conditions; (*a*) field current, 2.5 amperes; (*b*) field current, 1.05 amperes; and (*c*) field current, 3.0 amperes.

This problem illustrates the relation between armature current, field current and current-flux torque of a shunt motor.

ALTERNATING CURRENTS.

Problem 79.

A three-phase, 25-cycle, 2,200-volt, 12-pole induction motor has a rated full-load capacity of 1,000 horsepower. The ratio of transformation is 2,200:1,480 volts between terminals. The true equivalent single-phase resistances of the stator and rotor windings are 0.065 and 0.0386 ohm at 25 degrees centigrade. The ratios of effective to true resistances are 1.35 and 1.65 for the stator and rotor at 25 cycles. The equivalent single-phase leakage reactances of the stator and of the rotor referred to the stator are 0.35 and 0.31 ohm at the same frequency. The rotor winding is connected in star.

(*a*) What voltage should be impressed on this motor so that the starting current in the line will be 300 amperes? What would be the power, the power-factor and the torque at the moment of starting? (*b*) What reactance should be inserted in each phase of the rotor so that with full impressed voltage the starting current in the line will be 300 amperes? What would be the power, the power-factor and the torque at the moment of starting? (*c*) What resistance should be inserted in each phase of the rotor so that the starting current in the line will be 300 amperes? What would be the power, the power-factor, and the torque at the moment of starting? (*d*) If the impressed voltage is limited to its full-load value, what is the largest torque that can be obtained at starting? How would it be obtained and what would be the current, power and power-factor at the moment of starting?

This problem illustrates the operation of an induction motor at the instant of starting.

Solutions of the above problems and two new problems will be printed in the next issue.

$r_2=0.183\times[1+(75-25)/(234.5+25)]$
$=0.218$ ohm.

This is the equivalent single-phase resistance of the winding and is the value which should be used in calculations of the performance at approximately normal speed and a temperature of 75 degrees. It should not, however, be used when calculating the starting characteristics. At this time the proper resistance is the effective value. The reason for this is that at the normal running speed the frequency of the current in the rotor is so small that, as far as the losses are concerned, it acts about the same as a direct current. At starting, however, the frequency of the rotor current is the same as that of the current supplied to the stator and thus the effective resistance, i. e., that to alternating current, should be used.

Answer to Question f.

The equivalent single-phase impedance of both windings is equal to the impressed voltage at blocked condition divided by the equivalent single-phase current at that time and in this case is

by [3a] $Z=760/(\sqrt{3}\times289)$
$=1.52$ ohms.

The combined equivalent single-phase reactance is

by [5a] $X=\sqrt{1.52^2-0.467^2}$
$=1.45$ ohms.

Since the leakage rectances are assumed to be equal when reduced to the same side they are

$x_1=0.725$ ohm
$x_2=0.725$ ohm.

Meeting of Joint Committee on Line Construction.

The fifth meeting of the National Joint Committee on Overhead and Underground Line Construction was held on Wednesday, February 24.

The Committee devoted practically all day to continuing the work of revising the present power-wire crossing specifications, and dividing the work up into sections to be apportioned to various sub-committees for revision.

The Committee would greatly appreciate advice as to desirable requirements, and also detail criticism of any of the clauses of the present standard power-wire crossing specifications.

The meeting was called at 10:30 a. m., and adjourned at 5:30 p. m., to meet March 31. R. D. Coombs, 30 Church Street, New York City, is chairman.

Less than a year ago the Port Clinton (Ohio) Electric Light & Power Company, a Barstow property, closed a ten-year contract with the city to provide a new lighting system to give more than double the light produced under the old system. Already the business men of Port Clinton are clamoring for more light and negotiations are on foot to double the present number of lamps.

LETTERS TO THE EDITOR.

Concentric Wiring.

To the Editor:

It seems to the writer that the majority of the people who favor the Stannos or Kuhlos type do so with the idea that the introduction of this system will involve enormous savings in installation costs as against systems at present in use. However, after carefully considering the different elements that go with making a proper estimate for wiring, one will find that there can be, after all, but a very insignificant saving in substituting concentric wiring for the cheapest method at present in use, i. e., knob-and-tube work.

The concentric wire system, if allowed in this country at all, is adaptable only to the very cheapest installations—small new and old residences. With that idea in mind the writer compared several hundred estimates covering such installations in order to determine the exact proportion the material bears to the total estimate. The underlying reason for making these determinations was due to the fact that after all the labor and material items form the chief components of cost of any estimate.

In dissecting an estimate one will find it to be composed of the following:

Material.
Material overhead or burden.
Labor.
Labor overhead or burden.

Total net cost.
Per-cent profit.

Total bid or estimate.

In examining several hundred estimates the writer found that the material varied from 30 to 35 per cent of the total estimate for new houses and 25 to 30 per cent for old houses. This, of course, covered the entire material item. The actual cost of the wire used was only about 12.5 to 15 per cent.

With these facts in mind it is apparent that the adoption of Stannos would cause but a very insignificant saving in cost of wire only. Assuming that with adoption of concentric wire, switches and fuse blocks were cheapened, the total net saving in material cost would be very small indeed. The saving in labor cost due to the introduction of this wire would also be very small, if any at all.

Allowing all the claims made by Stannos one can readily see that at best a saving of but 7.5 to 10 per cent can be made. As the total cost of wiring the smaller residences varies from $35 to $55, at best but a small net gain can be made by the adoption of concentric wire.

In order to make a just comparison between our knob-and-tube system and Stannos system, it is fitting and proper that all the disadvantages of the latter be brought out in order that a total net gain may be arrived at.

One of the greatest problems confronting us with the adoption of concentric wires would be due to the necessity of providing suitable and positive means of grounding the outer sheath of the wire. The dangers of fire as well as to life due to poor ground connections, or where the metallic connection of the section of the sheathing has been broken, is enormous should the central conductor become for any reason grounded. The danger to life will be particularly aggravated since with the introduction of this system insulating joints will not be necessary on fixtures. The fire hazard will, of course, be materially increased owing to the fact that the outer covering being necessarily thin, it is more liable to crack due to bending during installation or vibration after installation. The outer covering being a conductor, any break in metallic continuity will cause flashing between sections.

The comparison here is made between the cheapest form of concealed wiring at present allowed, i. e., knob-and-tube system and the concentric wiring system. Of course were the comparison made between Stannos and our conduit or BX installations, the difference would be greater. It seems to the writer that in large cities where no concealed knob-and-tube work is permitted, it would be much preferable to permit the former rather than introduce Stannos. Concentric wiring is applicable to only the very cheapest installations. It is very doubtful whether it will make any inroads at all upon the better class of installations using BX or flexible and rigid conduit. Open cleat work will, in the opinion of the writer, hold its own against exposed concentric wiring, there being not much difference between the cost of the two.

A very serious objection to any very cheap and simple method of doing electrical work lies in the fact that inexperienced laymen and boys will attempt to do much of the smaller work. If there were means of keeping close inspection over such work, the harm would be eliminated. However, owing to its cheapness, concentric wiring will become an important staple of the mail-order houses and "fly-by-night" supply men, and thereby become available to every boy, who will be enabled to make additions to existing installations. Such additions naturally will be made regardless of rules governing such work, and prove an ever increasing hazard to fire and human life. In Europe such a condition does not exist, for the Continental has more respect for laws and fear due to faulty electrical work, so that he desists from doing such work.

After carefully considering all the advantages and disadvantages of concentric wiring there appears so much to be lost by such an introduction and so very little gain that there is little doubt but such an inroad will prove disastrous to the electrical industry in this country.

LEO DOLKART.

Moline, Ill.

Temperature of Lamp Bulbs.

To the Editor:

We note in the article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of lighting features of Filene's department store, that Mr. Chapman, the engineer of that company, has conducted some temperature tests on 500 and 750-watt Mazda C lamp bulbs. The statement is made that the average skin temperature of the 750 and 500-watt lamps installed is about 400 degrees Fahrenheit, hence the necessity of safeguarding the cords.

We have conducted numerous tests in our Engineering Department to ascertain the bulb temperatures of Mazda C lamps, and you may be interested to know of some of our results. Temperatures are in Fahrenheit degrees. Room temperature, 70 degrees.

TEMPERATURE OF MAZDA C LAMP BULBS.

Lamp Wattage.	Temperature of Bulb Opposite Filament.	Maximum Bulb Temperature.	Temperature of Bulb at the Socket.
500	248	300	182
750	261	280	210

We are led to believe that in order for Mr. Chapman, of the Filene Company, to obtain such a high temperature value (400 degrees) he must have held cotton waste or some such substance over the bulb of the thermometer to get a temperature reading. This method of ascertaining temperatures would be similar to the one used in obtaining readings on electrical machines after a heat run. It must be borne in mind, however, that in lamp-bulb temperature measurements, cotton waste or any other material should not be held over the thermometer bulb, because the radiant energy from the lamp filament will be intercepted and the material will absorb the radiation, thereby building up the temperature.

Our investigations were carried on by using the change-of-electrical-resistance method. Four turns of fine wire were wrapped around the bulb and the change in resistance was noted after the lamp had been burning until constant temperature conditions prevailed.

Using a thermometer, we were able to check our readings taken by the electrical method fairly well. The thermometer registered a little lower, however, due to the inability of obtaining a good contact of thermometer and lamp bulb.

C. J. BERRY,
Engineering Department, National Lamp Works.

Cleveland, O., March 11, 1915.

The life of water turbines is indicated by the fact that an installation used for pumping at Devonport, Tasmania, has been running for 22 years, and is reported good for at least 10 years more.

Commercial Practice
Management, Rates, New Business

Increasing the Sale of Energy to Department Stores.

The Boston department store of W. & A. Bacon Company has recently been refurnished with electric lighting equipment. The ground floor has an installation of about 100 250-watt nitrogen-filled lamps, installed in uniform bay spacing on about 25-foot centers. The lamps are provided with ground-glass bowls with brass housing, and are located 6 feet below the white ceiling and 15 feet above the floor, on brass tubing. Within the housing, above the bowl, is a corrugated glass collar about four inches wide.

Over the main floor, on either side of the building, is an electrically lighted sign to direct patrons to the elevator and basement. These signs are in the form of an arrow and are 14 feet long and 2 feet 6 inches wide. A white border around the rim of the faces carries a line of five-volt lamps, two in series, while the recessed letters, on a red background, are lighted by 14-volt lamps eight in series.

Mercantile Advertising Company (New York) composite letter signs are installed on pillars throughout the store to designate the various departments. These signs consist of separate letters, with two ground-glass faces, each a metal box 3 by 3 by 3.25 inches, containing a 10-watt Mazda lamp installed on a porcelain base with flanged edges which slides into a metal frame, the letters in order thus forming the desired words. The frame is clamped around the pillar and the feed wire enters the porcelain base of the nearest letter and the connection throughout the series is by a receptacle from one to another unit.

An entrance to the basement of the store from the Essex station of the Boston Elevated Railway has recently been opened. This is by two turnstiles leading from the platform direct to a vestibule 15 feet square, in front of which is a display window of plate glass 14 feet wide and 7 feet high. The window display is lighted by 40-watt Mazda lamps in corrugated glass mirror reflectors 10 inches in diameter, installed on conduit fastened to the ceiling, the units being 15 inches apart on centers and 7 inches inside the window casing. The upper part of the window is provided with a silk curtain which hangs about 24 inches from the top, which shields the lamps from sight.

Over the turnstile entrance is an illuminated sign 15 feet long and 15 inches high, with nine-inch letters forming the words "W. & A. Bacon Co. Entrance." The face of the sign is black-sanded and the letters are 1.5 inches deep, and in them are installed 160 four-candlepower, 110-volt carbon lamps burning in multiple. Mazda lamps first installed were taken out, owing to the vibration and suction due to passing trains. C. I. Brink, of South Boston, furnished the sign, the wiring being done by the Bacon Company's own electrical men.

Aside from the ground floor, the building is lighted by 100-watt Mazda lamps in three-light fixtures, with Holophane shades. Otis electrically operated escalators and elevators connect all floors. On the roof are two large sky signs bearing the firm name.

Power Plant Improvement in Madison.

The Madison (Ind.) Light & Railway Company has recently contracted with the General Electric Company for a 500-kilowatt steam turbine, motor-generator exciter set and switchboard; with the Alberger Pump and Condenser Company of New York for a surface-type condenser and auxiliaries; with the Cookson Steam Specialty Company of Cincinnati for a 500-horsepower open feed-water heater; with the Hill-Tripp Pump Company of Anderson, Ind., for a motor-driven vertical centrifugal deep-well pump, and with Charles Krauss & Sons for drilling a 12-inch deep well at the east side of the power plant building for cooling water for condenser.

These improvements are being made to provide duplicate generating apparatus to guard against accident to any of the present machinery in order that power and light customers using the company's service will be assured of continuous service at all times. While the present machinery has always given satisfactory service, due to the increasing number of motors being installed the company feels it should make this additional investment in generating apparatus which in addition to the added protection to customers will provide sufficient power capacity to take care of large motor installations up to 600 horsepower.

Chicago Electric Vehicle Meeting.

At the regular weekly luncheon meeting of the Chicago Section, Electric Vehicle Association of America, held at the Hotel Metropole, Chicago, on March 16, C. C. McMahon, of the Transportation Department, Commonwealth Edison Company, spoke of the electric-vehicle service of that company. The attendance was 35.

The Commonwealth Edison Company now has in service 124 electric vehicles and 171 horses. Three garages are maintained and the management of these was explained. The vehicles are thoroughly overhauled once a year. A service wagon takes care of breakdowns on the road, with the assistance of motorcycles. The wheel steer is preferred to bar steer, and all of the latter are being gradually changed over. A blank for battery-charging records was exhibited. Charging is regulated by ammeter and voltmeter. Although the vehicles are equipped with Sangamo ampere-hour meters, it was found that the condition of charge could not be closely enough regulated by these. Records of battery performance and tire performance are also kept. The methods of washing lead batteries and testing jars were described. Canopy tops have been replaced by cabs, and half curtains are used for wind shields. Regular meetings of employees are held at which are considered suggestions by drivers, etc., for improving service.

The discussion consisted mainly of questions, to which Mr. McMahon replied that bar steers wer discontinued because more liable to lead to accidents; ten vehicles are in the shop on the average; home-made lugs and uniform battery compartments are used for all batteries, which facilitates washing; separators last as long as the battery; the life of lead batteries is 10,000 to 12,000 miles; daily mileages run as high as 60; drivers of horses are retained to operate electric vehicles, and taught how.

Mr. Chalfont, secretary of the Electric Automobile Manufacturers' Association, was then called upon to tell of his six weeks' trip through the West, in which he visited 26 cities. He found conditions best where there was co-operation between dealers and central stations. There is a marked improvement in trade conditions since January 1, even in the cotton districts of Texas. Electric-car dealers, who have been dormant for several years, are getting quite active, and he saw good times ahead for the industry.

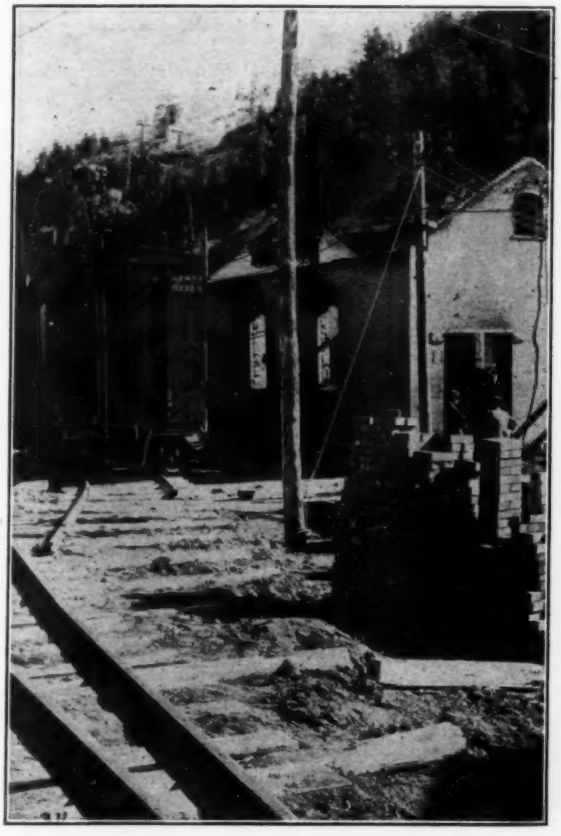
Service Re-established at Keohler Mine Within Fifty Hours After Total Destruction of Substation.

The substation at the Keohler mine of the St. Louis, Rocky Mountain & Pacific Company, containing rotaries, transformers, switchboards and other apparatus for producing direct current for the operation of the mine was completely destroyed by fire early Saturday morning, February 6. The St. Louis company operates all of its mines with power purchased from the Trinidad (Colo.) Electric Transmission, Railway & Gas Company, and the station which was destroyed contained two sets of apparatus, one being used on the central-station's 60-cycle power, and the other a 25-cycle equipment, used when the mine company was generating its own current, previous to signing a contract with the power company for the purchase of power, which service was inaugurated about 40 days previous to the fire. The origin of the fire is unknown, but within a few hours after the flames were discovered the substation and all equipment, valued at something like $20,000, were a total loss. The substation belonging to the power company, which is of the latest outdoor type, although in very close proximity to the scene of the conflagration, sustained practically no loss, and this good fortune is largely attributable to the simplified type of construction, and the fact that the use of all apparatus and material has been minimized.

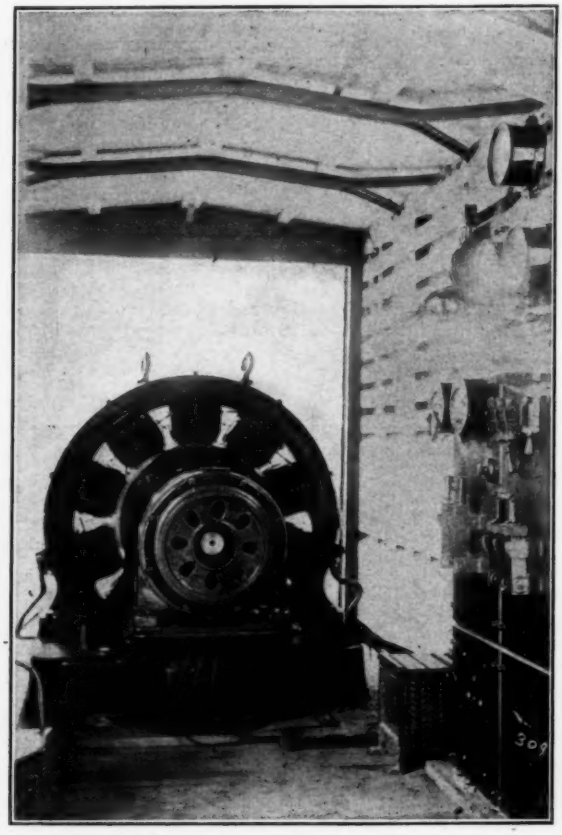
The country was literally dragged and scraped for available equipment to restore service, as the curtailment of operations at this mine, which produces more than 2,000 tons of coal per diem, and employs in the neighborhood of 450 men, would not only be of vital import to the company and its employees, but to several large industries which were dependent upon its output. Manager Franklin P. Wood of the power company was informed of the predicament in which the company had unfortunately been placed about 10 o'clock Saturday morning, and immediately put the wheels into motion, which culminated in the rather unusual feat of preparing and installing a new substation and re-establishing service at the Keohler mine within less than 50 hours after this disastrous fire, thus averting a shutdown of indefinite duration.

Three crews of experienced men were sent to the Trinidad power house. The first crew was delegated to tear out one of the rotary converters, used for producing direct current for the operation of the Trinidad street railway; another crew was assigned the task of moving the three-phase transformer belonging to the rotary converter, and the third crew gave their attention to dismounting and resetting the switchboard. While this work was being completed a special car was ordered from the Santa Fe Railroad—the only one available being a large furniture car, with sliding doors on the side and open at one end—which was switched around to a track near the power house during the afternoon. The car was too large to be set in on the power house spur and loaded direct, and this obstacle was overcome by switching a small flat car up to the rear entrance of the station, from which the equipment could in turn be loaded into the box car.

The process of moving and loading the rotary and transformer on to the flat car was one of considerable magnitude. In addition to being inconvenient to handle, the equipment weighed more than 10 tons and had to be handled entirely by hand, as the station is not equipped with proper apparatus to facilitate the work. It was necessary to raise the equipment up a short flight of stairs leading into the switchboard room, and then drag it to the rear entrance. After considerable jockeying



Temporary Substation on Siding Alongside Demolished Structure.



Interior of Freight Car Converted Into Temporary Substation.

and sparring throughout Saturday afternoon and night, this work was accomplished, and in the meantime the switchboard was being set up for service, and the old furniture car was being rapidly transformed for utilization as a portable substation. The flat car was switched to a convenient place, and the work of removing the rotary and transformer to the box car was soon completed, and early Sunday afternoon all equipment necessary for a new substation was in position and ready for the trip over the Continental Divide. Although a special train had been chartered to take the improvised substation to the Keohler mine, a regular Santa Fe freight was scheduled to leave about the time this car was ready, and it was coupled to this train, leaving Trinidad about 7:30 p. m. Sunday. The work of wiring, making connections and preparing the rolling substation for service was accomplished while the big car rocked lazily over Raton pass.

The electric whistles at the Keohler mine blew the call to work at the regular hour Monday morning, after the loss of only one working day, while half a thousand miners, facing a prospect of possibly 60 days' idleness, marched happily to their work.

It is probable that the best delivery that could have been made on equipment for a new substation would have been from 40 to 50 days, and the work of the power company in bringing relief to the mine in such a short time was an example of quick action and good hard work that is seldom equalled. Most of the men dismantling and moving the apparatus worked from 30 to 45 hours without rest. The first-aid work of the Trinidad company illuminates not only the desire but the ability of the central station to face complicated situations and to furnish service under all kinds of emergencies.

Central-Station Signs on New Building Construction.

Co-operating with contractors and architects, the Edison Electric Illuminating Company of Boston furnishes free lighting to advertising signboards, which display the names of the contractors, architects, and sometimes the firms providing materials, which are erected in front of buildings in process of construction. In connection with the advertisement of the parties mentioned, the Edison Company utilizes a third or less of the board to notify the public that its service is to be furnished the new building.

One such sign is shown in the accompanying illustration. This stand is in front of the new High School building now in process of construction in Arlington, Mass. The board is 20 feet long, 6 feet high, and stands about 4 feet above the ground. It is constructed entirely of wood.

The lettering is black, on white background, except for a strip of red a foot wide across the bottom, on which is inscribed: "Complete Electric Equipment on Edison Service."

The lighting is by four 100-watt Mazda lamps in close-fitting aluminum-painted reflectors carried on 0.5-inch galvanized conduit. The lamps are connected through Crouse-Hinds condulets from open wiring on the back of the board. In a square wooden box behind the sign are installed a meter and time switch. Ordinarily sign boards of this character are lighted from dusk to 11 p. m.

The interested parties provide the board and pay the cost of wiring, the Edison Company providing free energy in return for the use of a part of the surface for its own advertisement. At Arlington a second sign of the same description is

ARLINGTON HIGH SCHOOL
THE LIGHT, HEAT & POWER CORP'N
CONSTRUCTING ENGINEERS, BOSTON
ARCHITECTS, PRESCOTT & SIDEBOTTOM, BOSTON
COMPLETE ELECTRIC EQUIPMENT ON EDISON SERVICE

Temporary Sign on New Building Site.

installed on the side of the railroad right of way behind the school grounds.

Large Pennsylvania Corporation to Increase Its Power and Lighting Facilities in Up-State Counties.

That times are improving in the bituminous coal regions of Pennsylvania is evidenced by the determination of the Penn Central Light & Power Company to spend large sums in the improvement of its system, which supplies electrical power from Lewistown on the east to Twin Rocks, Cambria County, on the west, and to Kinport, Clearfield County, on the northwest.

The Penn Central Company furnishes power to 28 coal operations and to 10 Cambria County towns. The current comes from Warrior Ridge and from the company's new steam generating plant at Williamsburg, Blair County. The latter plant, only recently completed, will generate 7,500 horsepower, and is so constructed that its capacity can be doubled merely through the installation of another generator, all other equipment being already installed.

In February, 1910, the Citizens' Light, Heat & Power Company and the Edison Electric Illuminating Company, operating in and around Altoona, were purchased by the Juniata Water & Power Company. The latter company operated a combination steam and hydroelectric power station at Warrior Ridge, supplying a territory which included Huntingdon, the boroughs of Servistown, Reedsville and Yeagerstown and a number of quarry and sand operations. Cambria County, with its 150-year coal supply, was selected as an excellent field for development. Today Cambria County customers of the Penn Central Company are served with an aggregate connected load of 11,500 horsepower.

The Penn Central furnishes local companies with current for the lighting of Gallitzin, Cresson, Portage, Summerhill, Nantyglo, Twin Rocks, Patton, Hastings, and Wilmore, while Lilly, Barnesboro, Spangler and other towns are seeking service.

House-Wiring Campaign in Sandusky.

The Sandusky (Ohio) Gas & Electric Company is running a $12 house-wiring campaign for the month of March. For this amount, half down and the balance in monthly payments of 50 cents, the company wires and connects up any kitchen or laundry in any residence on its lines and gives the patron an electric iron and a 60-watt Mazda lamp. The purpose is to induce people to use electricity in a limited way and learn its value, with the idea that they will soon order their entire houses wired. Within two days several contracts were closed and all indications point to a very successful campaign.

Electric Grill in Chicago Hotel.

As an auxiliary to the kitchen equipment of its private-dining-room service, the Hotel Sherman, Chicago, has installed a Hughes electric grill range, having a maximum demand of 11 kilowatts. The range is equipped with a broiler and frying grid and four top heating units. There is a warming oven underneath.

The Hotel Sherman purchases all of its power from the Commonwealth Edison Company.

Employees Club at Sandusky.

Employees of the Sandusky (Ohio) Gas & Electric Company organized themselves into a "shop talk" and social club, in February, with the intention of holding monthly meetings. The organization was named the "Barstow Club" in honor of W. S. Barstow, president of the company. So much interest has been aroused by these meetings that there is now talk of holding them every two weeks, instead of once a month, as was first planned.

Electrical Construction

Telephone Switch.

The power company for whom I am working has several telephone lines entering one of its generating stations. The former method used was unsatisfactory. Extension bells had been installed on each line and the common double-pole baby knife switches were used for connecting the various lines to a local telephone set, giving communication with the calling party. (See Fig. 1.) It took some time to make the connection, as well as familiarity with the different combinations to be made.

There are, of course, small switchboards and even local-battery wall phones on the market, equipped with cords and plugs arranged in a practical and efficient manner, but none of these were on hand and the following idea was worked out. It has proved to be rapid and new operators can learn the system of switching

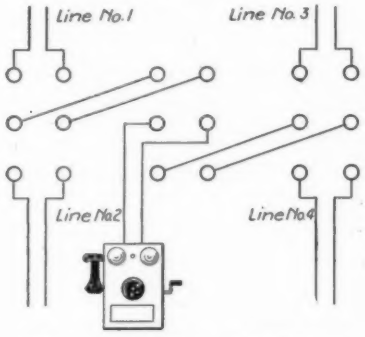


Fig. 1.—Old Method of Switching.

with less confusion than with plugs and jacks and cords.

A piece of fiber, slate or marble is cut into a circle with pins of the required number inserted around the edge, every other pin having no connection on back side and being a dead pin, to prevent possible short-circuiting of the lines or tying them together. The pins were made of brass machine screws with heads filed flat.

Two pieces of semicircular brass are mounted near the inside on the base (A and B, Fig. 2). A cross-connecting bar of brass is in two parts connected together with a fiber strip. Two pins of brass are inserted with a spring in each end of the bar and connected electrically together. One end of the bar is pointed and indicates the line where it stands. The two wires from the telephone are connected to the semicircular pieces of brass (A and B) and the line wires for line No. 1 are connected to the pins marked 1 opposite to each other across the disk; line No. 2 to the two pins marked 2, and so on around the switch (Fig. 3). Now the operator wishing to connect his phone to line No. 1 moves the bar, which is provided with a circular handle in the center, until the pointer shows 1. The line wire from

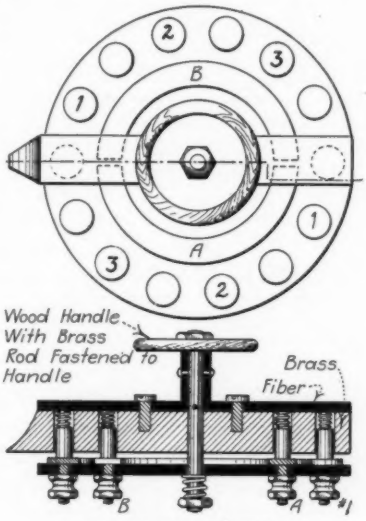


Fig. 2.—New Switch.

No. 1 is connected up through the pin from the bar, down to A, thence to the phone, returning to B, through the cross bar, down the pin to the other side of No. 1 line.

It can be seen that the operator can instantly switch to any line desired; there are no cords to become loose or broken; no switch handles come loose or switch blades tighten or loosen up as they do after continuous use; and the simplicity of the operation over any other method for eight lines or less is apparent.

J. D. Lewis.

Air Gap and Watts of Induction Motor.

A question was put to me recently that I believe is of somewhat general interest, viz., will increasing the air gap of an induction motor increase the watts input or merely the volt-amperes? My answer is: the wattless component of the current taken by an induction motor increases almost directly as the length of the air gap. Thus if an ammeter and a wattmeter were connected in an induction-motor circuit and an increase of air gap was effected the ammeter would show an increased value of current, but there would be no appreciable increase in the reading of the wattmeter.

H. E. Weightman.

Special Transportation Arrangements for National Electrical Contractors' Convention.

Elaborate plans for special transportation to the convention of the National Electrical Contractors Association, to be held at San Francisco, Cal., July 20-23, have been made and are published in an attractively illustrated booklet obtainable from V. C. Gilpin, master of transportation, 41 Gardner Avenue, Brooklyn, N. Y.

A special train with luxurious appointments will leave New York City at 5:35 p. m. July 10, traveling via the New York Central Lines to Chicago. The

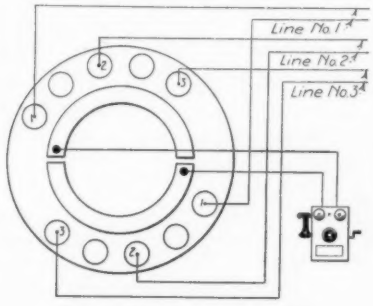


Fig. 3.—Connections to Switch.

Santa Fe system will then be used the rest of the way, making side trips to the Grand Canyon of the Colorado and the San Diego Exposition; San Francisco will be reached on the morning of July 18. Reservations on this train for the entire trip and from intermediate points to San Francisco should be made early.

For the return trip four tours have been planned. Tour A includes Portland, Yellowstone National Park, Salt Lake City, Pueblo, Denver, Omaha, Chicago. Tour B is similar, but omits Yellowstone National Park. Tour C includes Portland, Seattle, Vancouver and returns to Chicago via the Canadian Pacific. Tour D is direct from San Francisco to Chicago.

Copies of the illustrated transportation booklet and other information on the subject can be obtained through Mr. Gilpin.

Office Methods for the Electrical Contractor.

The extent to which work can be facilitated, and costly errors avoided in the work of the electrical contractor by the proper facilities, is quite generally realized, and yet there are comparatively few contractors who have worked out methods and provided the facilities which will be most helpful to them in their work. Just what should constitute these facilities depends, to some extent, upon the classes of work making up the principal volume of business. It must, to some extent, be devised by each individual to meet his own conditions.

The forms illustrated herewith are those used by the Hub Electric Company, of Chicago, whose office is under the management of W. J. Collins. Mr. Collins has given a great deal of attention to the proper arrangement of office work to facilitate the rapid execution of business, the elimination of errors, and to transact the work in the most efficient and least expensive way.

In this office a file is kept from cards, five by three inches in size, of every job upon which a bid is made. If the contract is secured this card is placed in a separate file, made up only of work in progress. The reverse side of this card is shown in Fig. 1, and successive entries are made on the various lines as fast as the work reaches the corresponding stage. At least once a week the office manager goes over this card file, and if for any reason progress is not shown upon each job, the reason for the delay is at once investigated. By means of this file it is easy to keep track of all work in progress.

The proposal blank, upon which bids are submitted, is shown in Fig. 2. This is printed on paper of the size of the ordinary business letter sheet. The back of this sheet is shown in Fig. 3. Blanks are provided to show all the outlets, switches, and any special material which is required in every room of the house to be wired. The totals from this sheet form a check upon the estimate which has been computed upon the basis of the wiring plans.

As soon as a contract is secured a filing envelope 11.5 by 9 inches is prepared for the given job, and all correspondence, estimates, and other papers concerned with this job are from time to time deposited in this envelope as the work proceeds. The face of this envelope is illustrated in Fig. 4. It contains blanks for entering all the principal items of information connected with the work, as well as the final results of costs for labor and material after the job is completed.

In the case of apartment houses, which constitute a considerable portion of the work done by this company, special blanks are used which fit conveniently into the job envelope, and which are arranged for the convenient division of the work according to the sections into which such apartment houses are usually divided. This has been found a convenience in handling this class of work. This estimate blank is shown in Fig. 5. Upon its back there is a summary of outlets, switches, etc., for each room of the building, somewhat similar to that shown in Fig. 3.

Contract received	Finish notice
City Permit	" M't'l delivered
Ready	" Started
Roughing delivered	" Complete
Job started	" Billed
Rough complete	" Payment
" Pickup	Fixture Contract
" Billed	" Complete
" Payment	Trouble:
Trouble:	"
"	"
"	"
"	Final Inspection
	" Payment
	Job cleared

Fig. 1.—Card for Following Work in Progress.

UNIFORM PROPOSAL
of the
HUB ELECTRIC CO.
1819 Carroll Ave. Phone Seeley 6440

Date _____
Proposal No. _____
Contract No. _____
Condition _____
Class _____

To _____, party of the second part

_____

(Arch.)
(Cont.) _____ Location _____

Hub Electric Company, party of the first part, hereinafter for brevity called the Company hereby propose to furnish all the labor and materials to do the Electrical Work in and about the premises located at _____

for the sum of _____ Dollars.

Payments therefor to be made by the party of the second part, to the Company in the following proportions: Sixty per cent (60%) when Roughed In, and balance of contract with whatever extra work that has been authorized will be immediately due, when final certificate is issued by the Electrical Inspection Department of _____, or within 30 days from date of completion of this work.

The work done and material furnished under this proposal to comply with all the City or Underwriters ordinances and rules as the case may apply governing this class of work, and said work shall be of the amount and kind designated in the plans, specifications and the accompanying schedule on the reverse side of this proposal.

_____

_____

The within proposal shall become a contract between the parties hereto when duplicate is signed and returned by the party of the second part to the Company within thirty days (30) from date above shown, otherwise the Company may declare this proposal null and void.

All additions, alterations or changes of any nature in this proposal must be made in writing and be signed by both parties hereto, which said writing shall set out and contain in full the character, extent, cost and condition of said changes. Superintendents and workmen are not allowed to make changes without the said written order

The Company use a standard line of materials which are approved by the National Board of Underwriters, and, unless otherwise agreed, the Company will use such standard of material for the work done.

Respectfully submitted,

The above proposal is hereby accepted,

this _____ day of _____ 19__

_____

HUB ELECTRIC COMPANY,

By _____

Fig. 2.—Proposal Form of Hub Electric Company.

Schedule of Work To Be Installed

LOCATION	CEILING OUTLETS			SIDEWALL OUTLETS			BASE PLUGS			S. P. SWITCHES			3-WAY SWITCH			(1) SPECIAL			(2) SPECIAL		
Front Porch																					
Sun Parlor																					
Living Room																					
Recp. Hall																					
Main Chambers																					
Serv. "																					
Front Passage																					
Rear "																					
Main Bath																					
Serv. "																					
Dining Room																					
Breakfast Porch																					
Kitchens																					
Closets																					
Butler Pantry																					
Pantry																					
Rear Porch																					
Public Lights — Outside																					
Public Lights — Vest.																					
Public Lights — Stair Halls																					
Public Lights — Rear "																					
Public Lights — Area "																					
Basement Genl.																					
" Toilets																					
" Store Rooms																					
Garage																					
Stores Genl.																					
" Base.																					
" Windows																					
" Toilets																					
TOTALS																					

	Letter Box Bells and Tubes		Dining Room Calls
	Rear Door Bells		Transformer For Bells
	Laundry Tubes		Janitor's Tubes
	Door Opener		Drop Cords and Sockets
	" " Pushes		Tel. Conduit
	Entrance Bells		Appt. Phones
	Vaccuum Switch		Laundry "
	Floor Push and Clamp		Janitor "
	" " " Daisy Fl. Tread		Vestibule "
	_____ Annunciators		
	_____ " Pushes		

(1) Special_____

(2) Special_____

Remarks_____

Fig. 3.—Schedule of Work to Accompany Proposal.

The workmen for this concern lose no time in going to the office. Each man goes from his home directly to the job representing his day's work, and is provided with a blank postalcard upon which, at the end of the day, he fills in the record of how his time has been spent. Upon this card there is also a space arranged for the requisition of any material which has been found lacking, and which will be necessary in the next day's work. This card is mailed as the man leaves his work, and is delivered at the office early the next morning by the mail carrier. Any material which has been requisitioned is then loaded upon one of the motor trucks, four of which are operated by the company, and the material is delivered to the workman during the course of the morning. At the end of the week these postalcards give a record of the workman's time, to be used in figuring costs, and also in figuring the man's pay. If a postalcard is lacking, it is assumed that the man was not working on that particular day. This relation of pay to postalcards causes this activity of the workmen to be very rarely overlooked. Payment is made by checks which are mailed each week to the workman's residence, so that it is unnecessary for him to report at the office even for this purpose.

The Hub Electric Company purchases its supplies in large quantities, thus securing the most advantageous prices and freight charges, and maintains a stock room of considerable proportions. The motor trucks above mentioned are loaded up each morning with the material necessary for the jobs in progress or about to be started, and the method used involves little delay on account of waiting for needed material.

License Required in Ottawa.

To do electrical installation work in Ottawa, Canada, a license is now required. The new law went into effect January 1. Like every other city, Ottawa had an army of inferior workmen who were constantly interfering with up-to-date installations and installing inferior work. With the inauguration of a licensing system for all electrical workers, this difficulty has been overcome, and the licensing has afforded a splendid protection to the reliable contractor.

Electrical workers, to obtain their permit, are required to take written examinations, the questions being grouped as follows: (1) motors and other electrical devices; (2) conduit installations; (3) knob and tube work, fixture hanging and repair work. The police are strictly enforcing the law. There is a penalty of $50 for working without a license. In addition to the license, electrical workers are required to submit proper plans and specifications for large electrical installations before a permit is granted for installing the work.

The fee for a license for an electrical worker is one dollar. The law states:

"'Electrical worker' shall mean and include any person engaged or occupied in or undertaking to do the actual work of placing, installing or altering electric wiring or other apparatus to which electricity is applied.

"No license shall be issued to an electrical worker until and unless he shall have filed with the chief constable a certificate from the electrical inspector of the city of Ottawa, to the effect that he has passed such examination as such inspector thinks necessary, and that in the opinion of such inspector he is competent to act as an electrical worker."

Among the Contractors.

George W. Hill, who has been traveling representative of the National Electrical Contractors' Association for some time past, has severed his connection with that organization in order to devote his entire time to the introduction of the accounting system which he has devised. This system is published by The H. & W. Accounting Bureau, Rock Island, Ill.

JOB	JOB ADDRESS
OWNER	CONTRACT
ARCHITECT	EXTRA
GEN. CONTRACTOR	COST
CLASS OF BLDG. Flats Stores	OVERHEAD
FIGURED FOR	PROFIT
Figured by Estimate	Finish notice
Bid sent Revised Revised	Finish material delivered
Contract received	Job started
City permit	Delay on finish
Rough material delivered	Finish time estimate Men Days
Job started	Finish complete
Delays on rough work	Finish billed
Rough time estimate Men Days	Finish payment
Rough complete	Charge Tickets
Rough pickup	Credit tickets
Rough billed	Notes:
Rough payment	
Charge tickets	Fixture contract
Credit "	" complete
Notes:	Final certificate
	" payment
Total labor	Total labor
" material	" material and inspection
" rough cost	" finish cost

Fig. 4.—Face of Filing Envelope.

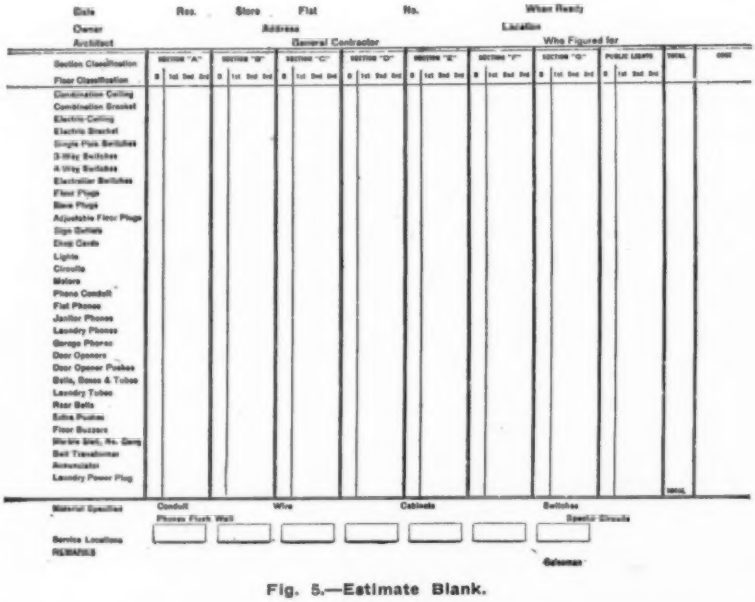


Fig. 5.—Estimate Blank.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, City Hall Annex, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. MacColl, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

This is the last word which will reach the members before the convention. I had hoped to give the list of speakers at the banquet on March 23, but up to the time of writing I have not received the list from the chairman of the sub-committee.

I have received word from Mr. Braddell (whose address, let me repeat, is 537 West Thirty-fourth Street, New York) that very few men have replied to him regarding the banquet.

Let me again call the members' attention to the fact that I sent postals to all the members at large with the bulletin and asked them to give Mr. Braddell their probable intention regarding the banquet promptly.

Section members were requested to notify the section secretaries and they in turn Mr. Braddell.

Do not forget the business meeting begins at 10 a. m. at Hotel Martinique, Tuesday, March 23. Also let all the out-of-town members possible plan to remain over March 24 and 25 for the meetings of the Electrical Committee at 123 William Street. These meetings will this year bring before us a number of matters of more than ordinary importance, of great moment and concern to both the inspection and installation interests. Every member who attends will go away feeling thoroughly repaid and enriched in experience by such attendance.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Stands for Heating Devices.

Question 290. Rule 25d provides that heating devices must be provided with an approved stand. What are the specifications of the Code for such stands, especially for smoothing and sad irons?

Answer 1 (F). There are none.

Answer. 2 (B). There are no specific specifications for these article, but on the inner side of the first cover of the edition of the Code attention is called to the fact that all appliances should be submitted to the Underwriters' Laboratories for examination and report before being introduced for use. All departments therefore who rely on these Laboratories should see that articles used are on the approved list. This applies to all Underwriters' departments and such municipal departments as work in harmony with and accept the findings of the Laboratories.

Answer 3 (W). None, so far as I know.

Answer 4 (A). I do not think the Code has specifications. The proper place to find this information is the Underwriters' Laboratories, Incorporated.

Answer 5 (H). I do not think the Code contains any specifications for stands to be used with heating devices.

Answer 6 (E). No specifications for such stands have been included in the Code. The question of approval I have felt is one for the Laboratories.

Answer 7 (P). The specifications for sad-iron stands are a product of the Laboratories and do not appear in the Code. The heel stands of approved irons will indicate generally what the specifications are.

Answer 8 (U). I should say none. Probably any heat-insulating material.

Answer 9 (O). The Code does not give specifications for an approved stand nor would it appear to be necessary. A stand to adequately protect combustible material would be dependent upon the temperature reached by the heater under abnormal or unusual conditions and the stand should be tested under such conditions by the Laboratories. An approved stand is one which is so listed by the Laboratories.

Answer 10 (N). There are none. All you can do is to examine list of approved fittings issued by the Laboratories.

Further, my experience goes to show that in the large majority of cases you will not be any better off then; because if you go back to the average domestic installation a few weeks later you will find the stand doing duty to hold up a butter box off the bottom of the refrigerator, or may be assisting to distribute weight on a piece of corn-beef undergoing the pressing process, or some similarly unanticipated and non-electrical functioning.

In other words one cannot change domestic ironing habits which have come down from remote ages by supplying heat-insulating stands approved or unapproved.

Of course in laundries, tailors' shops, etc., where employees are under supervision it is a different matter, but in the domestic case one's only recourse is education. This I fear most often comes as to the child by experience, when the warnings of its elders are disregarded. Just how many badly

scorched shirtwaists and ignited ironing sheets contribute we do not know and cannot guess. I believe the heel rest, air space combined with little metal, and highly radiating is best in domestic irons.

Varnished Cambric for Insulation.

Question 291. Is it possible to use varnished-cambric-insulated wire in conduit?

Answer 1 (F). Varnished-cambric insulation for wires appears to have all the advantages of rubber and slow-burning insulation without any of the disadvantages of either.

Answer 2 (B). It is possible to use varnished-cambric-insulated wires in conduit, and it is done in many cases. The National Electrical Code, however, does not refer specifically to this type of wire.

Answer 3 (W). It is possible to use varnished-cambric insulation in conduit, but not under Code rules. See Rule 26*n*.

Answer 4 (A). Present Code rules do not refer to this type of insulation. If you will refer to page 155 of the April "List of Approved Electrical Fittings" the answer will be found.

Answer 5 (H). Yes, if the insulation is covered with an approved braid and lead sheath.

Answer 6 (E). There is no Code rule giving direct approval for this use. The writer has approved it, however, when the insulation had a further protection of lead sheathing, this being for possible moisture that might appear in the conduit.

Answer 7 (P). For some years past we have been using varnished-cambric-insulated wire in this jurisdiction, and with generally satisfactory results, in conduit. For risers impregnating material should be solid enough to prevent weeping into cabinets, and in supporting the risers one should always remember that the insulation slips readily on a wire so that the supports should grip both the insulation and the wire.

Answer 8 (U). It is possible by special permission, but not under the present Code rules.

Answer 9 (O). Varnished cambric is not yet recognized in the Code specifically for conduit work, but its limited use as the equivalent of rubber has been advised for the purpose of obtaining field experience where the installation would be under constant supervision. The conclusion of the writer from a limited experience is that varnished cambric should not be used where it may be subjected to considerable bending or any great tensile stress, as the layers of varnished cambric tend to slide one upon the other. No failures have been noted in this jurisdiction in the insulation.

Answer 10 (N). Not under the strict Code rules (see Rule 26*n*). It is, however, tentatively allowed under supervision and for the gathering of information from field experience. This applies, of course, to interior work.

In exterior work, varnished-cambric cables have been and are used in numerous cases to great advantage.

Joints in Galvanized-Iron Wire.

Question 292. What experience has any of the members had in joints in galvanized-iron wire such as is used in fire-alarm work? Are these joints soldered and is an acid flux used?

(Secretary's Note: This question is evidently not on Code interpretation, but I sent it out under the clause in Article 2 which states one of our purposes to be "securing of better forms of construction and dissemination of information and correct practice, etc.")

Answer 1 (F). In this jurisdiction all the fire-alarm circuits are of copper.

Answer 2 (B). This question calls for experience of members and not for an interpretation of Code requirements. Any opinion based on my experience on this subject would be of little value.

Answer 3 (W). My experience has been somewhat limited, but I found that joints with copper splicing sleeves and properly fitting wires gave best satisfaction.

Answer 4 (A). My experience is never try to solder galvanized-iron joints. The flux and heat destroy the galvanizing and in a short time the joint will begin to rust. This introduces high resistance and causes trouble of all sorts.

Answer 5 (H). We have had no personal experience with such lines, but we understand galvanized-iron wire is used with or without soldered joints, as is more convenient.

Answer 6 (E). My experience with soldered joints on galvanized-iron wire has not been encouraging. The splices have corroded badly, due possibly to the acid used when soldering the splice. I have seen joints that had been covered with tin foil and then taped almost eaten through with corrosion.

Answer 7 (P). I have had no experience on this matter.

Answer 8 (U). I have had no experience with galvanized-iron wire.

Answer 9 (O). I do not consider my experience wide enough to warrant an opinion on this subject.

Answer 10 (N). In this territory all the joints in our galvanized-iron wire fire-alarm circuits are soldered. We have noted that considerable care must be used. A Western Union joint is made carefully, being careful not to mar the wire outside the joint. A non-acid soldering paste is used, as low heat as will flow the solder, which is then wiped out over the wire away from the joint. It is important that the joint be kept dry and this is accomplished by painting with an elastic enamel, the joint being carefully cleaned from grease, etc. Under these conditions we have found the joints to stand up better than unsoldered.

I imagine, however, that considerable will depend on the "exposure;" smoke from soft coal, vapors from manufacturing processes, etc., might and probably would totally change the results. Again, the joint must be made with thorough care. A joint such as the ordinary wireman makes in a copper wire with a dab of solder is worse than useless.

Finally, a joint in galvanized-iron wire is affected so much by the surroundings and skill of the workmen that no general statement more than above is warranted.

Connecticut Electrical Meeting.

The second annual meeting of the Get Together Club of the electrical interests of Connecticut was held at the Hotel Taft, New Haven, on Friday evening, February 26.

This club was formed for the purpose of enabling men connected with electrical industries in the State of Connecticut to meet occasionally and become better acquainted. It is composed of central-station men, contractors, jobbers and manufacturers. There are no by-laws and no dues. Its affairs are in the hands of an executive committee of three.

President L. D. Gibbs, of the New England Section, was the guest and gave a very interesting talk on the personal effort that is required and expected of every man in the electrical industry.

The following were elected as the executive committee for the ensuing year: G. B. Leland, Stamford Gas & Electric Company; W. D. Jennings, General Electric Company, New Haven; J. O. Morris, Electric Supply & Equipment Company.

Public Service Commissions

Conducted by William J. Norton

DISTRICT OF COLUMBIA.

Testing of Meters. The rules recently adopted by the Public Utilities Commission in regard to testing meters provide that all meters shall be tested in their permanent position on the consumer's premises, and when practicable at loads of 10 per cent of rated capacity and 60 to 100 per cent; also at normal load, if the test is upon request or for a referee test.

The following percentages of the connected load shall be regarded as normal load: Residence lighting 25; elevators, 40; factory lighting, churches, offices, stables, hotels and individual motor drives, 45; theaters, clubs, store lighting and factory group drive, 60; saloons, restaurants, pumps, 70; signs and window lighting, motion-picture machines and blowers, 100 per cent.

After testing, a meter shall be adjusted to have not more than one per cent error. Commutator-type meters of capacities less than 50 amperes shall be tested at least once every 18 months; 50 to 150 amperes, every 12 months; over 150 amperes, every 8 months; induction-type meters up to 50 amperes, every 30 months; 50 to 150 amperes, every 24 months; over 150 amperes, every 12 months. Voltage regulation shall be kept within 3 per cent of standard during lighting hours and 10 per cent at other hours.

IDAHO.

The Ashton and St. Anthony Power Company was granted a certificate of convenience and necessity authorizing it to construct a power plant and distribution system to serve Roberts and communities south of Roberts and around Mud Lake, in Jefferson County. The company is not to proceed under the order until it has secured a franchise from the village of Roberts, and filed the same with the Commission.

NEW YORK—First District.

New York Edison Company. The Public Service Commission for the First District has adopted an order directing the New York Edison Company to reduce the maximum rate for electric current in Manhattan and part of The Bronx from ten cents per kilowatt-hour, the present rate, to eight cents, and a general revision of the whole schedule of rates, in accordance with the change. This action was taken in the cases of George Stadtlander and others, and Julius Ewoldt and others against the New York Edison Company. These complaints were filed after the Edison Company established a new schedule of rates in 1911, by which only consumers paying more than $25 monthly got the benefit of any reduction. The complainants alleged that small consumers were thus discriminated against, and asked the Commission to order the company to reduce its rates so that consumers paying less than $25 per month would be benefited.

The opinion is based upon the fact that the New York Edison Company's net earnings for 1913 amounted to $7,802,732, and in 1914 to $7,150,000. The proposed reduction of the maximum charge to eight cents would mean a saving to consumers of about $2,000,000 a year, and this would still leave the company net earnings of $5,800,000, which would be a return of nearly 6 per cent upon $100,000,000. The company claims a value of something like $132,000,000. Commissioner Maltbie, in his opinion, found that $60,000,000 was the maximum amount upon which the company is entitled to a return. Commissioner Williams, without fixing the valuation, held that $100,000,000 must certainly cover "the capital actually expended in the enterprise."

A detailed valuation of the company's property was not submitted by any of the parties during the investigation. Commissioner McCall says: "The long delay that would necessarily be involved in an appraisal or valuation of the property of this company is a deterrent from insisting upon same as perhaps the only method of reaching any positive solution in this rate question; and a further justification for not insisting upon it is to be found in the fact that in my judgment we have sufficient proof before us to justify an order giving immediate relief from conditions that demonstrate that the earnings of the company are away beyond what would be justified as a reasonable average return by the most favorable finding that could possibly be reached in the company's favor as to capital actually expended, etc., by any process adopted to ascertain same."

Commissioner Maltbie, in his opinion, states that while an inventory and appraisal may be of assistance in determining with great precision the exact rate for each class of consumers, they are not necessary.

His opinion takes up the law and practice in New York and cities, among others the following reference taken from the Buffalo Gas Company vs. Buffalo: "So far as we are aware, there has never been any decision of any court which is binding upon this Commission, which holds that cost of reproduction new, with or without depreciation, is a controlling factor in the fixing of value for rate-making purposes."

In the supplementary opinion filed by Commissioner Maltbie dealing specifically with the petition of the Merchants' Association, intervener, he says: "With reference to the necessity for an appraisal, counsel for the Merchants' Association has cited a number of cases in which appraisals were ordered, but he has failed to produce a single decision which holds that an inventory and appraisal must be made before any revision of rates may be ordered. In any rate case the value of the property used in behalf of the public is a very important consideration, but it is not necessary that the value be decided on the basis of opinions of engineers and experts rather than on the basis of the facts as revealed by the books and records relating to the property of the corporation. The Commission is agreed that relief in the pending cases shall not be withheld until an appraisal is made."

In the opinions of Commissioners Williams and McCall they go on record as against "meter charge." In Commissioner Maltbie's supplementary opinion he says: "The refusal of the Commission to adopt a meter, consumer or minimum charge is directly contrary to the evidence. The record shows clearly that there are certain costs which have no direct relation to the amount of current consumed. They are nearly the same, whether the consumption is small or large. Not only are these facts recognized by many companies, but most of the recent decisions of state commissions in electric

rate cases have approved or required the establishment of a meter, consumer or minimum charge. The Public Service Commission for the Second District has followed the same course.

"If a meter charge is not to be adopted the factor ought to be embodied in a schedule of rates in some other way. But to disregard the fact of fixed expenses in framing a schedule of rates and to say that all persons consuming less than 500 or 100 kilowatt-hours monthly must pay the same rate (eight cents per kilowatt-hour) is illogical, contrary to the evidence, and will continue certain unjust discriminations which are now part of the rate schedule of the New York Edison Company.

"Further, the adoption of an eight-cent maximum rate for both light and power is illogical, and in no way justified. The record shows that the cost of free lamp renewals is approximately one-half cent per kilowatt-hour. This is an expense which is not incurred in connection with the power business. This company recognizes this in its rate schedule, and accordingly makes the maximum rate for lighting one-half cent more than the rate for power, and makes still further concession to power customers using more than 200 kilowatt-hours. The power business is to a great extent business off the peak, and far less subject to seasonal fluctuation than lighting. There is, therefore, no justification for making the same maximum rate apply to power, as well as to lighting."

Second District.

Westchester Lighting Company. Both the complainants and the company have asked the Public Service Commission to practically begin all over again the Westchester Lighting cases, which have already been before the Commission almost since its inauguration. The complainants, representing various towns and villages of Westchester County, have attacked the valuation of the Westchester Lighting Company, on which the decision of the Commission was based, while the attorneys for the company pleaded that the Commission should not have separated the gas and electric business of the company in figuring the return to which it was entitled as a corporate entity.

Chairman Van Santvoord stated that the Commission has no funds which can be devoted to the investigation of the company and the revaluation of its property. Both sides have submitted briefs and the Commission has reserved decision as to whether or not it would reopen the case.

OHIO.

The Circleville Light and Power Company was authorized to issue $70,000 principal sum, 25-year, first-mortgage, six-per-cent bonds, to be secured by an open mortgage in the sum of $250,000. This issue is in lieu of a former issue of first-mortgage six-per-cent bonds in the sum of $70,000, to be secured by a closed mortgage in the sum of $70,000. The former order is modified so that bonds hereafter issued to pay for additions, extensions and improvements, as provided in such mortgage may be secured thereby instead of issuing a second or other mortgage, as would be necessary under the original plan of financing.

WISCONSIN.

Janesville Water Company. In a proceeding before the Railroad Commission to determine the value of the Janesville Water Company, for the purpose of acquisition of the property by the City of Janesville, the Commission says: "With regard to discount on bonds, the Commission has taken the stand that it may be reasonable to recognize this element where the discount is a normal and reasonable cost of getting money to finance a utility where the utility is needed in the community, and where the money for financing it can be obtained on no better terms. In an earlier investigation of the Janesville Waterworks (7 W. R. C. R. 628-639), the question of discount on bonds was considered by the Commission, and the conclusion was stated as follows: 'Some allowance probably will have to be made in fixing the value of the plant for the discount on bonds, but it is questionable whether all of the $19,600 accounted for should be considered as a plant investment.'

"There are no facts before us in the present case which would lead us to alter the conclusion above quoted. There seems to be no reason to question the propriety of issuing bonds under the circumstances under which those in question were issued. Authorities are not by any means agreed that the discount incurred in floating bonds should be permanently charged to capital. The difficulties which would be met with if this policy were pursued in the case of refunding issues are, of course, apparent, in that the amount of discount charged to capital might eventually be entirely out of proportion to the actual value of the property."

A table prepared by the Commission's auditor is given, showing the rate of return received by the company, which ranges from 4.3 per cent, as estimated for 1892, up to 11.2 per cent for 1913, and 11 per cent for the first six months of 1914. Without drawing a definite conclusion from the financial history of the company as to actual losses incurred, the Commission says:

"There can be no question that it would cost a considerable amount to build up a business under conditions similar to those prevailing in Janesville, but where a new utility was to be installed to meet a hitherto unsupplied demand for service, to the point where a reasonable return would be earned upon the investment. To determine how much this cost would be is a matter of estimate. From such information as is available on this subject, it seems that the cost of building up such a business would probably be between 5 per cent and 15 per cent of the total value of the physical plant, and consideration may well be given to this fact in fixing upon the final value of the property.

"The company claims an allowance for going value of about 20 per cent of the actual investment, with an overhead allowance of 15 per cent included in the investment. We see no reason for any extended discussion of this claim, as the amount of going value which should be allowed should be determined as largely as possible from the evidence presented in each particular case, and we find nothing in the record in this case which would justify as large an allowance as that claimed."

UNITED STATES SUPREME COURT DECISION.

The Supreme Court has held that it is beyond the power of the states to require a railroad to carry one commodity or class of traffic at a loss or only nominal profit, even though an adequate profit is obtained from its business as a whole within the state. Under this principle the court annulled the North Dakota lignite-coal-rate law as to the Northern Pacific and the Minneapolis, St. Paul & Sault Ste. Marie Railroads, and the West Virginia two-cent passenger-rate law as to the Norfolk & Western. Justice Hughes announced the decisions. Justice Pitney alone dissented. In arriving at its general conclusion the Court held that when a state selects one commodity or class of traffic for regulation it must apportion to it a proper part of all general expenses, and then allow substantial compensation. In the West Virginia case, Justice Hughes says: "It would appear to be outside the field of reasonable adjustment that the state should demand the carriage of passengers at a rate so low that it could be justified only by placing upon shippers of goods a burden of excessive charges in order to supply an adequate return for the entire service."

Furthermore, such action could not be justified as a "declaration of public policy" to develop an infant industry or to make one community independent of another.

New Electrical and Mechanical Appliances

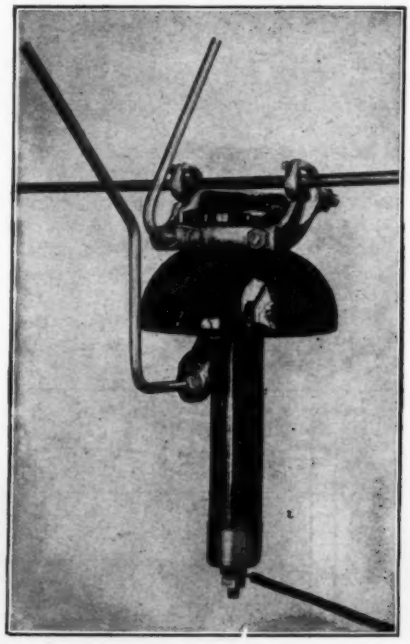
Central Suction Cleaner.

A new type of electrically driven suction cleaner has been placed on the market by the Central Electric Company, 326 South Fifth Avenue, Chicago, Ill. This cleaner has a number of interesting features, one of which is its light weight, this being only nine pounds complete; another is the low price of $25 placed on the complete outfit. This cleaner has many of the features, in the way of minor refinements, that are to be found only on higher priced machines. Suction is supplied by means of a powerful motor-driven fan. The motor operates on either direct current or alternating current. A brush attachment is included in the outfit for loosening threads or lint so that the suction may draw them up as well as dust and dirt. This brush can be easily removed for cleaning. The brush is equipped with rubber-tired wheels which makes it revolve with every movement of the machine. The machine itself is mounted on easily running wheels. The rear wheel may be raised or lowered by means of an adjustable device to suit the thickness of the rug or carpet. A feed-through switch is provided in the handle, which is shaped for conveniently operating the machine. The machine is neatly finished and makes an attractive appearance.

New Central Electric Suction Cleaner.

Burke Suspension-Type Lightning Arresters.

The accompanying illustration shows a new lightning arrester for 2,200 and 6,600-volt service recently placed on the market by the Railway & Industrial Engineering Company, Pittsburgh, Pa. It is known as the Burke suspension-type lightning arrester, and consists of an adjustable horn gap with a resistance in series with the ground circuit. The arrester can be suspended direct from the transmission line; it is not necessary to cut the line, and no special mounting is required.



Suspension Lightning Arrester.

All metal parts of the outfit are of brass. Koppat resistance is used in the ground circuit to limit the flow of dynamic current which might otherwise result if two or more phases discharged simultaneously. These arresters can be used on circuits of any capacity.

Illuminating Glassware for the Rosenbaum Department Store.

The chief desire of the committee having in charge the installation of the lighting devices used in the new Rosenbaum store, Pittsburgh, Pa., was that glass manufacturers make new features. It was desired to use nitrogen-filled lamps of high intensity. The committee wanted an inclosing globe and was opposed to the semi-direct system that has become so popular. It was practically decided that an inclosing globe of blown translucent glass of special design should be used. It was shown that the glass being blown would in the original design show the filaments of the lamp. As this was objectionable, the architects decided that the glass must be frosted, as it was not believed possible to obtain blown translucent glass that would be opaque enough to hide the filaments. The engineers now strenuously objected to sand-blasted or frosted glass, claiming rightly that more dirt would collect, which would not only be an objection but also reduce the efficiency of the installation.

At this point the Jefferson Glass Company, Follansbee, W. Va., offered a semi-translucent glass, its Moonstone, which it guaranteed would not show the filaments and need not be frosted nor sand-blasted and yet would diffuse a maximum of light. After a series of tests the contracts were awarded to the Lighting Studios Company, of New York, for the entire installation, this to be equipped with Moonstone glass.

The engineers claimed that they will be spared the taking down of the glassware for washing purposes, which would have to be done at least every two months, while with Moonstone glass the shades could be cleaned with a feather duster or soft cloth without removing the glass.

The competition for this installation was exceptionally keen and the Jefferson Glass Company therefore felt greatly gratified in securing the order wholly on the merits of Moonstone glass.

Electricity in the Kitchen for Cooking and Dishwashing.

A growing appreciation of the importance of using the most sanitary methods in the preparation of food for the table and in the treatment of all dishes, utensils, etc., in which the food is cooked or served, is stimulating increasing attention to electrical methods and equipment for this purpose. This was well exemplified by the great interest in the exhibits of

electrical kitchen equipment at the last New York Electrical Show, and particularly in the display made by Wells, Mowbray & Newman, Incorporated, of 125 West Forty-second Street, New York City. A complete kitchen was shown in which was an array of the highest class of electrical equipment, such as electric range, electric refrigerator, electric dishwasher, water sterilizer, kitchen table with electric warming closet and power mixer, etc. Space does not permit detailed reference to all this equipment, but the range and dishwasher will be described.

The electric ranges are made in several types, two of which are shown herewith. The smaller, or what is known as the bungalow range, has an oven 14 inches wide, 16 inches deep and 11 inches high; the broiler in the top of the oven is 14 inches square. The surface cooking space is 24 inches square. The broiler is operated by the same heating unit that operates the top cooking surface.

What is known as the Biltmore range No. 1 has a top cooking surface 16 by 32 inches. The dimensions of the entire top space are 24.5 by 42.5 inches. The oven is somewhat larger than in the bungalow range. There is also an electric salamander 13.75 by 16 by 7.5 inches and an upright broiler 11 by 3 by 9.5 inches. The total connected load of this range is about 6.7 kilowatts, while of the bungalow range it is 3.5 kilowatts.

The heating elements in these ranges are of extra heavy construction, such as is required for heavy hotel service; consequently in residence service they are practically indestructible. However, they are arranged so as to be readily replaced, if needed. Each unit is arranged for full heat and half heat. Switches for the control of the various units are all of the indicating push-button type and are all conveniently mounted together on a shelf. Fuses and connections are also located on this shelf and may be easily reached through a hinged door on top of the switch compartment.

Walker Electric Dishwasher, with Wall Broken Away to Show Principle.

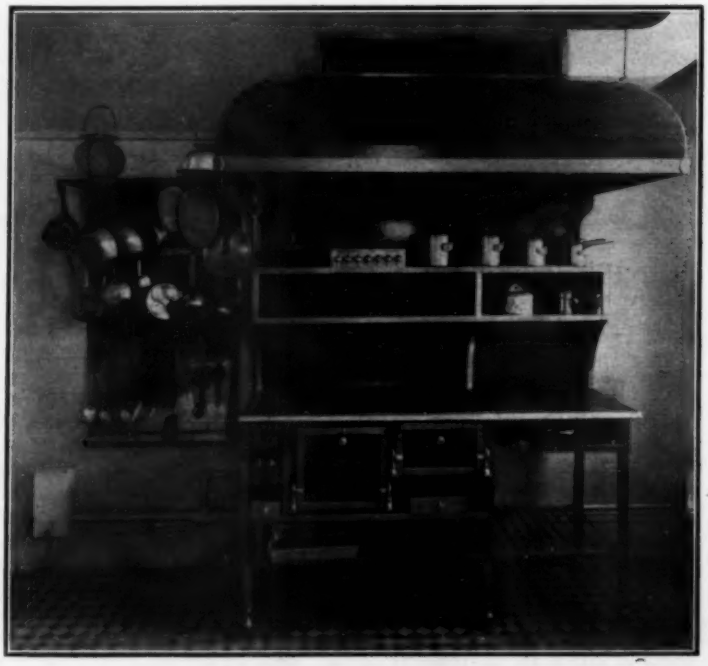
Aside from the electrical fittings, the ranges are equipped with handy shelves and drawers for cooking utensils and supplies. The body of the range is made of heavy black sheet steel with facings of polished Russia iron. The trim is of polished steel, Monel metal or German silver.

The electric dishwasher shown in partial section herewith is made by the Walker Brothers Company, Syracuse, N. Y. Its design is such as to eliminate in a satisfactory way the drudgery connected with cleansing dishes after use and at the same time to do the work thoroughly, in a much more sanitary manner and in less time. The simplicity of construction is made clear by the illustration. The tank is smooth inside so it can be easily kept clean. The lower part is shaped to permit quick drainage into the discharge pipe, which is opened by means of the lever valve. The motor-driven impeller forces powerful streams of hot soap water over and among all the dishes which are set in wire trays as indicated. Most convenience is obtained by having the hot water and drain pipes permanently connected to the dishwasher; the latter is furnished, in some portable types, however, for use where pipe connection is not available.

Dishwashing by this electric method is very rapid and entirely automatic. While the machine is pumping the hot water over the dishes, other work may be attended to. This part of the process lasts but a few minutes and requires little current. After the wash water is discharged, the drain valve is closed and fresh hot water added. This is then forced about the dishes by the pump to rinse them perfectly clean for part of a minute and when again drained off the dishes are ready for stacking away in the pantry. No dishcloth or drying cloth is used; drying is automatic because the hot dishes quickly lose surface moisture without wiping.

All parts of the machine are sturdily built and neatly finished. The motor is well protected and out of the way. Walker dishwashers for manual operation by a lever are also made. The electrically driven machine, however, removes the last objection to the irksomeness of cleaning dishes.

Bungalow-Type Electric Range.



Electric Range for Large Residence.

McIntosh & Seymour Oil and Steam-Engine Exhibit at San Francisco.

Conspicuous among the oil engines exhibited at the Panama-Pacific International Exposition is the 525-brake-horsepower Diesel type unit on the space occupied by the McIntosh & Seymour Corporation, of Auburn, N. Y. This engine is said to be the largest and most powerful of its class in the whole exposition; it also represents a high achievement in engine efficiency, simplicity and perfection in workmanship. By observing how quietly and smoothly this engine operates the visitor gains an appreciation of its high-class design and construction.

The McIntosh & Seymour Corporation has gained world-wide renown in the domain of steam engines. It is one of the few American engineering firms that has competed successfully with European manufacturers not only in South America, Australasia, Africa and the Far East but also in their own continent, and its products have earned the praise of many foreign leaders of engine design and construction.

The McIntosh & Seymour Corporation has had a long association with world's fairs. Its exhibit 22 years ago at the World's Columbian Exposition at Chicago, for instance, was one of the leading engine displays of that event. During the course of its history, this firm has built machinery aggregating more than 1,500,000 horsepower. It has constructed some of the biggest engines in the world, the size having been limited only by the restrictions of shipment and transport. Three mammoth engines of 5,000 kilowatt capacity each, built by the Auburn firm, are installed in the Redondo central station of the Pacific Light & Power Company, and other powerful sets from the same works can be seen in notable power plants all over the United States.

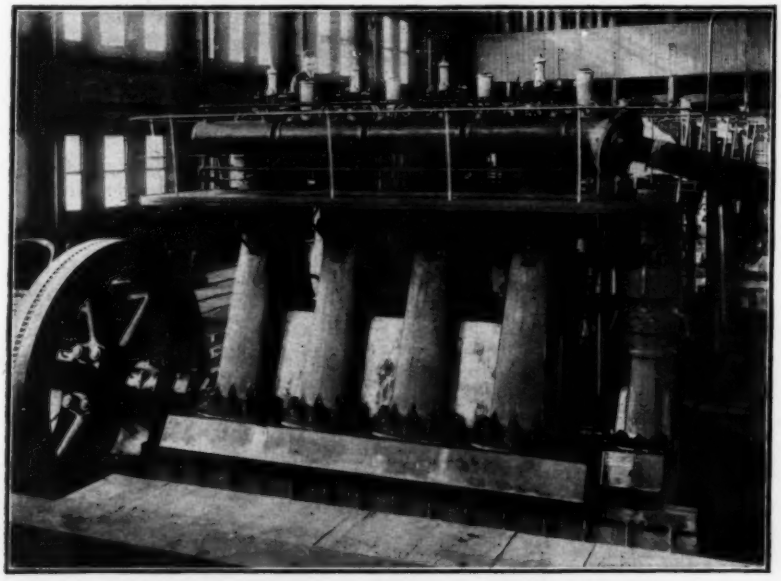
By contrast with the giant engines built in former years the single-cylinder horizontal 100-kilowatt steam unit representing the McIntosh & Seymour Corporation in the Palace of Machinery at this exposition is a dwarf in size. Its economy and efficiency, however, render it noteworthy. Two reasons have been responsible for the selection of such a relatively small unit to typify and illustrate this firm's steam-engine construction. In the first place, fashions have changed, and the mammoth reciprocating steam engine is no longer demanded. Secondly, the scope for the steam engine in California is destined to become less now than the Diesel type engine, which burns the fuel oil directly, can supplant it with greater satisfaction and to better advantage. The small steam unit shown in operation responds to the most exacting demand of the discriminating steam engineer, who can appreciate that reliable service is the foremost and greatest quality of machinery.

Of the two Diesel-type engines which were installed by the McIntosh & Seymour Corporation, the larger set is shown in operation, using the fuel oil supplied at the header in the Machinery Palace. At the price of 92 cents per barrel of 42 gallons, this fuel will give about 850 brake-horsepower-hours, or say 525 kilowatt-hours, at a cost of one dollar, the consumption of the engine being remarkably low.

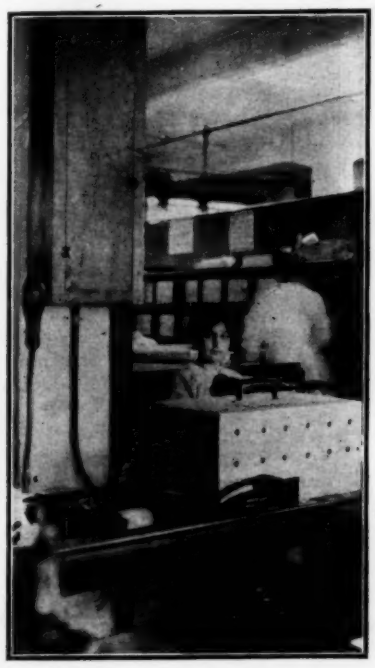
With four cylinders and operating on the four-stroke cycle, this engine develops the power at 165 revolutions per minute. It is of a design and construction that have been perfected by 17 years' association with the problems of Diesel work, the McIntosh & Seymour Corporation deriving this advantage from co-operation with the first and earliest Diesel engine factory built in Europe. This fine engine conforms to the latest practice of the European engineers, whose experience and knowledge of Diesel engine construction are unrivalled, this type having been freely developed there by firms of great and untarnished repute.

The smaller Diesel-type engine on the space occupied by the McIntosh & Seymour exhibit is a four-cylinder set of 280 brake horsepower capacity, designed to run at 200 revolutions per minute. In character it is distinguished from the larger set chiefly by its box frame and by the greater compactness due to the higher running speed.

Both these engines are remarkable for the extraordinary high grade of workmanship in all the finished parts, a tolerance of only half of one-thousandth of an inch being permited in the manufacture. They are representative of the most worthy achievements of American engineers and set a high standard for Diesel-engine work in this country.



McIntosh & Seymour Diesel Oil Engine, 525 Brake Horsepower.



Motor-Inclosing Box.

Motor-Inclosing Box.

A galvanized-iron box inclosing the motor has been provided for sewing machines operated in a New England shoe factory. Holes one inch in diameter ventilate the motor, and a metal handle is attached to the top of the box, enabling it to be removed readily.

This is one of the "Safety First" devices which have become general in a large number of industries throughout the country.

Beacon Electric Friar's Lantern.

A novelty in the way of an electric lantern is that shown in the accompanying illustration. The form of this outfit is that used in the old style friar's lanterns in which oil furnished the light. This lantern is equipped with an Aladdin primary battery and is guaranteed to give

Electric Friar's Lantern

five hours of continuous or ten hours of intermittent service. A Mazda lamp is used. The metal parts of this outfit are finished in nickel, giving it a very attractive appearance. This outfit is manufactured by the Beacon Miniature Electric Company, 108 Duane Street, New York City.

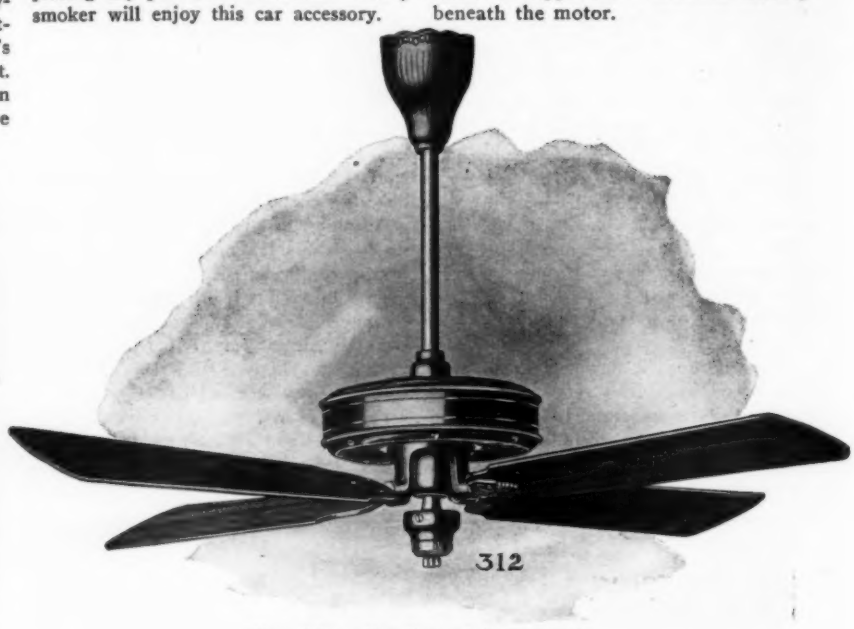
Combination Electric Cigar Lighter and Inspection Lamp for Automobile Use.

An automobile accessory in the form of a combination electric cigar lighter, acetylene-lamp lighter and incandescent repair lamp, made by the Metal Specialties Manufacturing Company, of Chicago, Ill., is now on the market and has proven itself to be a very useful article for gasoline automobiles and electric vehicles. The lamp is six inches in length and can be kept handy at one's elbow ready for instant use.

The lighter is made of pure platinum wire and is readily removable. Tips and bulbs can be furnished for different volt-

Combined Cigar Lighter and Lamp.

ages from 6 to 21. There are separate ivory-finish push buttons for the lamp and the lighter. A cigar or cigarette is easily lighted while going at any speed. The repair lamp is very handy for purposes of inspection, especially for making repairs on the road after dark. The ten feet of cord attached is sufficient for exploring any part of the machine. Every smoker will enjoy this car accessory.



New Alternating-Current Ceiling Fan.

A New Robbins & Myers Alternating-Current Ceiling Fan.

A new ceiling fan, just announced by the Robbins & Myers Company, Springfield, O., has a self-starting, shaded-pole type of induction motor. The field coils are securely attached to the laminated steel core and are thoroughly insulated from it. The rotor is built up of electrical sheet-steel laminations with copper conductors securely riveted to the copper end rings.

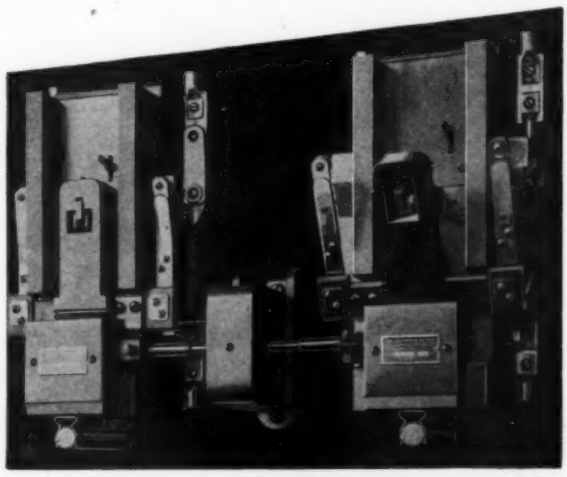
A ball bearing is used, consisting of upper and lower hardened steel plates ground to size, with the separator containing 14 large, high-grade steel balls. This bearing is immersed in oil. The oil is poured through a hole in the top of the motor body and passes through the lower oil chamber. A spiral groove in the bearing acts as a centrifugal pump when the fan is operating, thus circulating the oil along the shaft continuously from the lower to the upper chamber.

The fan has four blades with a sweep 54 inches in diameter. The blade length is 23.75 inches; the width is 5.5 inches at the shank end and 6.75 inches at the outer end. The blade shank is supported in the hub directly beneath the motor.

This fan is regularly equipped with a three-point, two-speed switch and regulator. The switch serves to start and stop the fan as well as to regulate its running speeds.

Automatic Switch for Emergency Connection of Lighting Circuits to Auxiliary Source.

A recent development in automatic switches, for use when two sources of current are available in subways, theaters, etc., where the exigencies of the service are such that an interruption of lighting service might produce serious results, is illustrated herewith.



Automatic Lighting-Current Transfer Switch.

This device consists of two magnet-operated switches with a mechanical interlock that prevents both switches being closed at the same time. The magnetic feature includes an ingenious automatic device that causes the opening of one switch and the closing of the other on a potential drop of predetermined value. The switch is normally closed to a preferred source of energy; the auxiliary system is thrown in upon the failure of the preferred source and the normal connection re-established upon the return of full potential to line. In the event of both circuits being dead, the switch automatically closes to the one first available.

The manufacturers of this device state that this switch will handle 600-volt railway circuits successfully and that it transfers the lighting load from the regular to the auxiliary source of potential so rapidly that the momentary outage in the lighting system is not noticeable.

This switch represents a new addition to the line of magnet-control switches manufactured by the Palmer Electric & Manufacturing Company, Boston, Mass.

A New Type of Trolley Frog.

There are a great many designs of trolley frogs on the market. Some have advantages over others in the straight under-run and flexible-approach features, easy method of installation, and long life under severe operating conditions. Some have the advantage of being designed in only one degree of angle to take care of all conditions regardless of the degree of curvature of the track, necessitating the carrying of only two styles of stock; that is, the right hand and left hand. The latest development in this line is the Westinghouse type BR frog. This is a trolley frog without movable parts that can be used with entire success at points where high speeds are obtained, the design being such that the trolley wheel does not travel on its flanges, and therefore no bump occurs when the bearing of the wheel is transferred from the groove to the flange. It is this bump that invariably dislodges the wheel from the wire.

New Type of Trolley Frog.

Designing engineers and operating men have been experimenting for over 20 years to perfect a trolley frog that would prevent the wheel traveling on its flanges, and various frogs have been designed with a reasonable amount of success, some having a movable tongue electrically operated by a solenoid which is under the control of the motorman. Others have movable tongues mechanically connected by bell cranks to the tie rod of the track switch and are operated by changing the position of the track switch. The new type, however, is the only trolley frog yet designed that accomplishes these results without mechanical or electrical connections, thus eliminating the undesirable feature of a movable tongue.

The illustration shows the new Westinghouse frog for a 15-degree angle designed for city service, though the manufacturer is prepared to furnish this type of frog in either an 8-degree or 10-degree angle for high-speed interurban service.

The malleable-iron frog has recently become popular on account of its long life as compared with the bronze frog, although a great many operating men prefer the latter on account of the longer life obtained from the trolley wheels. This argument does not apply to the type BR malleable-iron frog, as the resistance to the passage of the trolley wheel is less than with any design of bronze frog. Therefore a wheel will give longer life operating under the new malleable-iron frog because the flanges of the wheel never engage the frog body, practically eliminating the arcing at these points.

This type can be placed almost directly over the track-switch point, preventing the side wear of the wire caused by the wheel riding angularly before entering the frog. When the frog is placed in its proper position the wheel will be in a position to engage the turnout runner before it commences to grind the side of the wire. Due to the overlapping of the runners, there is practically a continuous contact of the tread of the wheel during the period of transition.

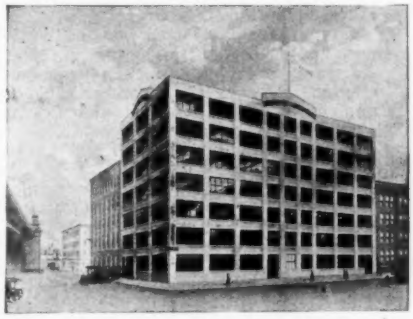
Schaeffer & Budenberg Company Occupies New Plant.

The Schaeffer & Budenberg Manufacturing Company, Brooklyn, N. Y., has completed and is now occupying its new plant located at Berry and South Fifth Streets in that city. As the accompanying illustration shows, the new building is a concrete structure of the most modern type and design, absolutely fireproof, and comprising seven floors, 10,000 square feet to the floor.

The transfer of the company's mass of machinery and elaborate chemical and testing apparatus was carefully planned in advance with a view to securing a maximum of efficiency and speed, with the consequence that the moving operation was attended with exceptional smoothness and a total absence of waste movement. Due to this, the plant was in working condition at an earlier date than expected and every department is now in full operation.

For accessibility, this new plant is excellently situated, South Fifth Street running parallel with the Williamsburg Bridge and Berry Street being a short distance (towards the river) from the Bridge Plaza (Brooklyn side, of course). Convenient transit facilities, particularly freight, combined with its handy proximity to the heart of New York City, are marked advantages of the location. The complete manufacturing organization, as well as the home office of the concern, are located at these new quarters.

The Schaeffer & Budenberg Manufacturing Company is the United States branch of a world-wide organization, having manufacturing branches in practically every civilized country on the globe. Founded in 1850, this organization is today the largest manufacturer in its line in the world. An idea as to its size can be gained from the fact that in one of its many European factories upwards of 5,000 hands are employed. The United States branch of this great enterprise was established in 1878, over 37 years ago. During this period it has earned a reputation for high quality of product that has built up the American organization in Brooklyn to such an extent as to culminate now in the building of its own plant.



New Schaeffer & Budenberg Plant.

In the main office, which occupies one-half of an entire floor (5,000 square feet), there has been erected a spacious exhibition room which is completely equipped with a representative and complete line of the numerous instruments and testing apparatus made by the concern.

It might be added that the Schaeffer & Budenberg Manufacturing Company, of Brooklyn, manufactures a complete line of thermometers, indicating gauges, recording gauges, recording thermometers, counters, time recorders, recording and indicating tachometers, electric pyrometers, steam, oil and gas-engine indicators, steam calorimeters, gauge testers, as well as innumerable other allied instruments.

Latest Approved Fittings

CONDUIT BOXES.—The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

For use with rigid conduit. Catalog Nos. 0108, 0109. For use in concrete construction only, catalog No. 4½CO.

For use with flexible tubing. With or without clamps, catalog Nos. 0227, 0237, 0260, 0262.

Approved Februarv 9, 1915.

CONDUIT BOXES.—The Federal Electric Company, P. O. Box 1406, Pittsburgh, Pa.

Federal pressed-steel conduit boxes. Catalog Nos. 3000, 3300, 3301, 3302, 4000-5 inclusive, 4400, 4401, 4402.

Also above with covers.

Approved January 28, 1915.

CONDUIT BOXES, Attachments for.—J. C. Phelps, 392 Main Street, Springfield, Mass.

Covers for standard outlet boxes with extension fittings for securing National metal molding and exposed conduit to concealed conduit system and with support for standard snap switches, receptacles and rosettes.

Covers only, catalog Nos. 10, 11, 15, 16, 1654 and 20.

For National metal molding, catalog Nos. 50 C., 50 C. O., 50 C. O. S., 50 C. O. I., 55 R. C., 55 R. C. O., 55 R. C. O. S., 55 R. C. O. I., 55 SQ. C., 55 SQ. C. O., 55 SQ. C. O. S., 55 SQ. C. O. I., 75 C., 75 C. O., 7520 C., 7520 C. O., 75 FS. C., and 75 FS. C. O.

For exposed conduit, catalog Nos. 40, 45 R., and 45 SQ.

Approved February 9, 1915.

FUSES, Cartridge Inclosed. Multi-Refillable Fuse Company, 729 Fulton Street, Chicago, Ill.

Non - refillable cartridge inclosed fuses.

Ferrule type, 0-60 amperes, 250 volts.

Approved February 9, 1915.

LAMP ADJUSTER.—Gund Manufacturing Company, La Crosse, Wis.

"Two-Ball Adjuster," consisting of two pulleys, one to be suspended from ceiling and other suspended on slack loop of cord.

Approved Feburary 5, 1915.

MOLDING FITTINGS. — J. C. Phelps, 392 Main Street, Springfield, Mass.

Junction and outlet boxes for use with National metal molding. Catalog Nos. 60 C., 60 C. O., 60 C. O. S., 60 C. O. I., 70 C., 70 C. O.

Extension attachments for securing National metal molding in conduit outlet boxes, catalog Nos. 50 C., 50 C. O., 50 C. O. S., 50 C. O. I., 55 R. C., 55 R. C. O., 55 R. C. O. S., 55 R. C. O. I., 55 SQ. C., 55 SQ. C. O., 55 SQ. C. O. S., 55 SQ. C. O. I., 75 C., 75 C. O., 7520 C., 7520 C. O., 75 FS. C., and 75 FS. C. O.

Approved February 9, 1915.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

PICTURE MACHINES AND APPLIANCES. — Motion Picture Fire Protection Device Company, 1326 Tribune Building, Chicago, Ill.

"Film Circuit Closer."

This device consists of a cam-operated motor switch, for use on motor-operated picture machines, so designed that in case of a broken film or release of tension on take-up reel, motor circuit is opened.

Examination and tests indicate that when properly installed, this device affords a certain degree of protection agains hazards incident to breaking of films or failure of take-up reel.

This appliance is considered suitable for use when installed in a manner satisfactory to inspection department having jurisdiction with standard parts supplied by manufacturer.

Approved February 9, 1915.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.

1500 watts, 250 volts, catalog No. 156722.

Standard for use only in approved one-light fixtures especially constructed to provide a complete inclosure of receptacle, and adequate separation between current-carrying metal parts of receptacle and metal of fixture.

Approved February 6, 1915.

SIGNAL APPLIANCES.—America Model and Instrument Company, 25 Forster Street, Worcester, Mass.

"Amico" signal system for control of bells and horns. A code signal device controlling a low-voltage battery current used to operate magnet of a relay switch which controls bell or horn circuit of not over 6 amperes at 125 volts. Bells and horns to be wired in multiple.

Standard for use with standard 125-volt bells or horns and when bell and horn circuits are installed in accordance with Class C of the National Electrical Code.

Approved February 9, 1915.

SOCKETS, Standard.—The Bryant Electric Company, Bridgeport, Conn.

Keyless porcelain - shell sockets. "Bryant" or "Perkins." 1500 watts, 600 volts, catalog Nos. 4077-80 inclusive.

Standard for use only in places where they will not be exposed to hard usage.

Approved February 9, 1915.

SOCKETS, Weatherproof. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins." 1500 watts, 600 volts. Porcelain shell, catalog Nos. 4081-94 inclusive.

Standard for use with incandescent lamps in series on 600-volt circuits.

Approved February 9, 1915.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Pressure regulators, Bulletin No. 6753.

Approved February 9, 1915.

SWITCHES, Automatic. — General Electric Company, Schenectady, N. Y.

Pressure governors for electrically driven air compressors and hydraulic pumps.

Type MH, 50 amperes, 600 volts.

Not approved for use in connection with automatic sprinklers or similar fire protective equipments for which service their merits have not been investigated.

Approved February 9, 1915.

SWITCHES, Automatic.—Andrus & Loveland Company, 214 Moffat Block, Detroit, Mich., submittor, manufactured by The Caille Brothers Company, Detroit, Mich.

Safety elevator control switch.

An inclosed, spring-opened switch automatically closed by elevator door and connected in series with car controller so that car cannot be started until door is properly closed.

10 amperes, 250 volts.

Note.—When properly installed, maintained and used, a device of this type, which makes it necessary that all doors be closed before an electric elevator can be started, is judged to be a desirable part of an electric elevator equipment under normal service conditions.

Approved February 19, 1915.

SWITCHES, Combination Cutout.—Mutual Electric and Machine Company, Wheeling, W. Va.

Panelboard switch consisting of a quick make-and-break switch mechanism with fuse clips mounted thereon; branch busbars and terminal plates forming stationary contacts.

Bull Dog, 30 amperes, 250 volts.

Approved February 9, 1915.

SWITCH BOXES.—The Cleveland Pressed Steel Company, 526 Chapman Avenue, Cleveland, O.

C. P. & S. Co. pressed-steel boxes for mounting flush switches and receptacles and having one removable side to facilitate assembly for use in gangs.

Approved January 2, 1915.

Current Electrical News

ATLANTIC STATES.

CHICOPEE, MASS.—This city will expend $1,200 for new electric lights. The total appropriation for electric lighting for the coming year is $20,200. W.

CHICOPEE FALLS, MASS.—Citizens of this community are campaigning for the placing of electric light and power wires in underground conduits. The mayor, city solicitor, a majority of the aldermen, and the Board of Trade are recorded in favor. The cost of conduits in Main and Exchange Streets is estimated at $28,000.

THOMPSONVILLE, CONN. — The Hartford & Springfield Street Railway Company plans to extend its lines from this place to Suffield, to connect with the electric railway in that town. W.

AUBURN, N. Y.—The Empire Gas & Electric Company will probably build a new 30-mile telephone line on its transmission system. It may also build an additional five miles of steel-tower transmission lines, and expects to install an additional 1,000 kilowatts in transformer capacity in the Geneva plant, these transformers to connect with the 13,000-volt transmission line.

ALLENTOWN, PA.—The Second National Bank, of this city, will erect a new $70,000 building on the site of its present structure. All the lighting fixtures will be of the most advanced type. Thomas E. Ritter is president.

ALLENTOWN, PA. — The meat-packing firm of Arbogast & Bastian will erect a six-story addition to their plant here. Much electrical apparatus is used in the operation of their large abattoir and it is reported that the addition will be similarly equipped.

ALLENTOWN, PA. — The City Council will shortly ask for bids for an electric pump for the City Water Supply Station here. The unit to be installed will probably be of about 5,000,000 gallons capacity. This is the first step in what is proposed to be the entire electrification of the pumping station. Current will be supplied by the Lehigh Valley Light and Power Company. R. J. Wheeler is superintendent of public property and Charles Blazer is engineer of the water department for the city.

EASTON, PA.—A large seven-story and basement department-store building will be erected by the firm of William Laubach & Sons, Incorporated, here. It is said that the plans call for an extensive electrical equipment.

CORRY, PA.—The Corry City Electric Light Company, B. E. Waltz, manager, expects to rehabilitate and reconstruct practically all of its city lines during the coming spring and summer. The company is now building a twelve and one-half-mile, 33,000-volt transmission line to connect with a similar transmission line owned by the Erie Lighting Company, tapping this line at Union City, Pa. There will be fine brick and steel substations built at Corry, Union City and Elgin. These facilities will serve the entire territory along the line into Corry; special power rates will be worked out, and manufacturing accommodations will be on a par with any of the larger cities, including the Niagara Falls district.

NORTH CENTRAL STATES.

CINCINNATI, O. — The Western Hill Realty Company will expend $150,000 developing properties at Price Lake. A novel idea in street illumination is planned. Instead of the ordinary iron poles for lights, brick pillars are to be used.

CINCINNATI, O.—A block electric plant, which is designed to furnish current for all purposes in a limited district, is planned by a group of business men including Walter H. Hutzler and others, who will apply for a franchise for that purpose. It is announced that $50,000 has already been subscribed toward the company's stock, and that a steam-power plant will be constructed to generate electricity. L.

CINCINNATI, O.—S. S. and G. H. Godley, architects, have let to the Roche-Bruner Company, of this city, the general contract for the construction of the 10-story building to be built for Val Duttenhofer, at Sixth and Sycamore Streets, but this does not include the equipment. The building will contain four elevators, two passenger and two freight, a vacuum-cleaning system, a refrigerating system, etc. The general contract was let at $184,000. L.

MANSFIELD, O.—The city will ask for bids on city lighting about April 15, and the successful party will have to install considerable lamp equipment.

SIDNEY, O.—A co-operative house-wiring campaign is to be conducted by the Sidney Electric Company, with the assistance of Leon Siff and A. S. Daneman. L.

MILLTOWN, IND.—The trustees of Milltown have granted a franchise to supply electric light to the Electric Service Company, composed of David S. Cook, J. Harry Lemmon, Henry S. Gray, William S. Speed and E. J. Heimerdinger. The contract provides that the service company is to furnish sixty 60-watt lamps for street lighting for $720 a year. Lighting rates are specified at a minimum of $1 a month, ranging from 14 to 12 cents per kilowatt-hour, with a flat rate of 12 cents for power.

SPRINGFIELD, ILL.—The Springfield Gas and Electric Company has recently secured a franchise for commercial lighting and a contract for street lighting in the village of Rochester, and will extend its high-tension line a distance of three miles from the Tuxhorn Coal Company's mine which was connected up last year. The company also has under consideration a four-mile extension of its high-tension line to connect the Jones & Adams Coal Company's mine for the installation of approximately 1,000 horsepower.

LAPEER, MICH. — A proposition will be voted upon to bond the village for $20,000 for a lighting plant.

MULLIKEN, MICH. — An active campaign has been begun by local residents for electric lights and power. The business men of the town have addressed a petition to the Commonwealth Power Company asking for an immediate investigation of the project.

HIBBING, MINN. — The Great Northern Power Company, which is to make an extension of its lines to Nashwauk this spring, is negotiating with the water and light board of this place to share the cost and the use of the high-tension line which is soon to be built to Alice. As the two lines are to go part of the distance over the same ground it is thought that the village and the company could use the same poles without detriment to either. Construction of the line will be under the direction of Burns & McDonnell, consulting engineers, Kansas City, Mo.

MANKATO, MINN.—The Electrical Supply and Construction Company, of this place, has been awarded the contract for the wiring of the Martin County Poor House, Fairmont, Minn.

MINNEAPOLIS, MINN.—The C. L. Pillsbury Company will in a few days issue specifications for the electrical construction work on a power plant to be built at the state reformatory, St. Cloud, Minn. The work will cost approximately $5,000, and will be done under the direction of the Minnesota State Board of Control. Specifications will also be issued for electrical work to the amount of about $1,500 on cell house D of the St. Cloud Reformatory.

GRAND FORKS, N. D.—The electric light plant of this city is to be extended this spring. The Grand Forks Concrete Company received the general contract for the work on its bid of $6,870.

KANSAS CITY, MO.—The Kansas City Electrical Construction Company was awarded the contract, at $3,186, for wiring and fixtures in the Mark Twain School, and the Baker Electrical Construction Company received the contract for wiring and fixtures in the William Cullen Bryant School, at $3,100, both $100,000 structures to be built at once. Motor equipment for ventilation was not included. M.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The Neal Electric Company has the contract from the Board of Education for all the electric installations, vacuum-cleaning systems, inter-communicating telephones and magneto clock systems in the new male high school, the Twenty-fifth and A Streets school and the Forty-first and Garland Avenue school.

MIDDLESBORO, KY.—H. J. Herron, proprietor of the Middlesboro

Electrical Works, is adding a garage to the primary enterprise and will use electrical power supplied by the large plant. G.

WEST POINT, KY.—G. H. Greenup, of Elizabethtown, Ky., a member of the Greenup Electric Company, which owns and operates a number of electric power plants in Kentucky, is inquiring as to a franchise which is to be offered for sale here. The Board of Trustees probably will offer the franchise for sale in the near future. G.

DRESDEN, TENN.—It is announced here that the $27,000 municipal bonds voted to provide funds to install a lighting plant and water system have been sold. Mayor R. L. Suddath expects to make the installation at the earliest possible date. G.

WESTERN STATES.

ELLENSBURG, WASH. — Acting on the recommendation of J. D. Ross, Superintendent of Municipal Lighting, Seattle, the City Council has instructed City Engineer Carter to prepare plans for an auxiliary steam plant, to be run in conjunction with the local municipal lighting plant—same to cost $60,000. It is reported the work will be started as soon as plans are completed, and materials placed on the ground. O.

KELSO, WASH. — An extensive change and improvement in the lighting system of this city has been agreed upon by the City Council and Washington-Oregon Corporation. Plans for the installation of new 60-watt Mazda lamps in the residence district, in place of the old-style 32-candlepower lamps, and 100-watt and 200-watt Mazda lamps, to be substituted for the old arc lamps, are being made. O.

SEATTLE, WASH.—Councilman Erickson's light reduction bill, containing a few slight changes, has been passed by the City Council, fixing residence lighting rates at five and one-half cents per kilowatt-hour for amounts less than 45 kilowatt-hours per month, and two cents for any quantity in excess of that figure. The rate in force for the past year has been six cents for amounts up to 60 kilowatt-hours, and two cents for quantities in excess of 60 kilowatt-hours. O.

SEATTLE, WASH.The city of Seattle Lighting Department, J. D. Ross, superintendent, will use approximately the following new material in 1915: six 4/0, 2,500-volt feeders, averaging 3,000 feet in length; eleven 300-ampere station voltage regulators; one 7.5-kilowatt pole-type voltage regulator; nine street circuit feeders; six series arc transformers; three 300-kilowatt outdoor substations; 250 one to 50-kilowatt distribution transformers; $200,000 in poles, cross-arms, wires, meters, street-lighting fixtures, lamps, etc.

BENICIA, CAL.—Bids will be received up to April 3 for furnishing and installing at the United States Arsenal here, a 2,300-volt power and light line.

LOS ANGELES, CAL.—The township of Bell is to be lighted with electricity as the result of an election held at Bell recently. The system will be installed by the Pacific Light and Power Company.

RIVERSIDE, CAL. — Petitions for the installation of ornamental lights on the east side of town will be presented to the council at an early date. The cost of the proposed system is estimated at $20,000.

RIVERSIDE, CAL.—Floyd Brown has been sold a franchise for the manufacture and sale of electric power for lighting and heating in the Palo Verde Valley.

SAN DIEGO, CAL.—The San Diego Consolidated Gas and Electric Company has in view a nine-mile, 11,000-volt, three-phase line from the town of Otay to the Otay dam site, to supply the new filtration plant of the city of San Diego. The company is also preparing to change the street-lighting system in the city of San Diego from inclosed carbon arcs to 600-candlepower Mazda Novalux units. There will be about 700 of these. The company also contemplates building two new single-phase, 2,300-volt, and one new three-phase, 2,300-volt feeders from the main power station.

SANTA ANA, CAL.—The Board of Supervisors has received a petition from property owners of El Modena for the formation of a lighting district there.

VENICE, CAL.—Plans and specifications have been completed by J. R. Griffin, chief engineer of the Abbott Kinney Company, for the installation of an electric generating plant to take care of the lighting system of the company and its properties in this city. Bids will be taken at once, and it is hoped the plant will be completed by July 1. The estimated cost of the plant is $70,000.

FOREIGN TRADE OPPORTUNITIES.

[Addresses and other information may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each opportunity and give file number.]

NO. 15,850. ELECTRIC FIXTURES, SUPPLIES, ETC.—An American consular officer in South America reports that a firm in his district, which operates gas and electric light plants, is desirous of communicating with American dealers and manufacturers of gas and electric fixtures, electrical apparatus, including stoves and toys, supplies and machinery. Catalogs and correspondence may be in English, but Spanish is preferred.

NO. 15,865. MAGNETOS.—A firm of pump specialists in Europe has informed an American consul that it desires to get in communication with American manufacturers of high-tension magnetos for single-cylinder gasoline engines of 1 to 6 horsepower. A sample machine is desired for inspection. Full particulars, prices, conditions of payment, etc., should be sent at once. It is stated that cash will not be paid in advance. The firm states that if the terms, etc., are satisfactory an order for 50 magnetos will be made at once, with possible supplementary orders during the year totaling about 200.

NO. 15,868. ELECTRIC CRANES.—An American consular officer in Africa has transmitted plans, specifications, etc., relative to an opportunity for American firms to bid on supplying seven 5-ton and one 10-ton electric cranes for a port in his district. Bids will be opened about April 30, 1915. The consul also forwards the names of firms which may be in a position to represent American manufacturers, if such arrangment is desired. The plans, specifications, etc., may be examined at the Bureau of Foreign and Domestic Commerce and its branch offices.

NO. 15,872. ELECTROTYPING AND PHOTOLITHOGRAPHING MACHINERY. — The commercial agent of the Bureau of Foreign and Domestic Commerce in New York City reports that there seems to be an opportunity for American manufacturers of electrotyping and photolithographing machinery to secure an order from one of the Latin-American governments. The matter may be taken up with a business man in New York City.

NO. 15,892. WIRELESS, PLANTS.—An American consular officer in Latin America reports that the government is contemplating the erection of wireless stations, and that full information is desired relative to apparatus, supplies, etc., and installation of complete wireless plants. Correspondence, etc., should be in the Spanish language.

NEW INCORPORATIONS.

NEW YORK, N. Y.—General Lighting Fixture Company, Incorporated. Capital $5,000. Incorporators: Isidor P. Heller, Mitchel J. Lubow and David Eisenstat.

COLUMBIA, S. C.—The Southern Improvement Company has been chartered with a capital of $3,000. The officers are E. T. Summersett, president, and Cora L. Summersett, secretary.

BUFFALO, N. Y.—Beacon Electrical Engineering and Construction Company, Incorporated. Capital $10,000. Incorporators: John E. Hoffman, George E. Butler and George E. Hipp, all of Buffalo.

NEW YORK, N. Y.—Motom Electric Company, Incorporated. Electrical contracting, etc.: capital $100,000. Incorporators: Edwin T. Vanderpoel, Richard D. Wyckoff and Christopher A. Shea, all of New York City.

NEW YORK, N. Y.—The New York Electric Garage Corporation has been established to operate a garage especially for electrics. Capital $50,000. The incorporators are: Isabel W. Bonner, Robert R. Livingston and John W. Crandall.

WORCESTER, MASS.—The North Pacific Public Service Company has been incorporated with a capital stock of $2,000,000 for the manufacture of light, heat and power. The incorporators are W. W. Seymour, W. E. Wardwell, F. S. Stranahan.

NEW YORK, N. Y.—McLeod Ward & Company, Incorporated. To deal in electrical supplies. Capital $15,000. The incorporators are: Willard D. Bass, Park Ridge, N. J.; Howard D. Demarest, Harrington Park, N. J., and Edward Holloway, New York City.

BOSTON, MASS. — Federal Sign Company has been incorporated with a capital stock of $1,000, for the manufacture of electric signs and specialties. The incorporators are: Sheldon E. Wardwell, Haverhill; W. W. Somer, New York City; G. J. Lauffe, Boston.

COLUMBIA, S. C.—A charter has been issued to the Tevern Electric Company to do a general electric business. The company is capitalized at $10,000. The officers are R. A. Childs, president and secretary, and Lewis A. Tervern, treasurer and general manager.

BOSTON, MASS. — The Andrews Electric Company has been incor-

porated with a capital stock of $3,000. The incorporators are: A. H. Andrews, G. F. Barton, A. B. Spencer, G. W. Smith. The purpose is, wholesale and retail dealers in electric and gas fixtures. W.

BOSTON, MASS.—The Boston Construction Company has been organized to develop and distribute water powers; capital stock $50,000. The incorporators are: President, Harold Plimpton, Higham; treasurer, Charles H. Fish, Brookline; director, Edward W. O'Brien, Providence, R. I. W.

BOSTON, MASS. — The Russell Falls Company has been incorporated with a capital stock of $700,000, to manufacture paper, buy and lease electric or hydraulic plants; build dams, flumes and power stations. The president is E. W. O'Brien, Providence, R. I.; clerk, R. S. Warner, Boston; treasurer, W. C. Pierce, Boston. W.

RIVERSIDE, CAL.—The Phipps group of capitalists are behind a $10,000,000 public utility corporation, which has been granted a charter in Delaware to operate in California as the Central California Electric Corporation. The latitude given by the charter in the public utility field is wide, particularly in operating telephone and telegraph companies. The incorporators are Lawrence C. Phipps and M. D. Thatcher, of Dover, Del., and Delos A. Chappel and Arthur B. West, of Riverside, Cal.

FINANCIAL NOTES.

The Northwestern Electric Company is offering $1,200,000 six-per-cent preferred stock to the general public. The issue consists of $2,000,000, of which $800,000 has been taken by California men. Proceeds of the stock will be used to retire short-term notes issued in connection with the hydroelectric generating and distributing system of the company, which is a competitor of Portland Railway, Light and Power Company in the light and power business in Portland, Ore. It is controlled by the interests identified with the Great Western Power Company.

The Pacific Gas and Electric Company has sold to N. W. Halsey & Company and Harris, Forbes & Company, New York City, $2,000,000 general and refunding five-per-cent bonds, $5,000,000 of which are at present deposited as part collateral for the $4,000,000 one year five-per-cent notes issued December 15, 1914, and of which $1,000,000 will be retired March 25 from the proceeds of the sale of these bonds. The California Railroad Commission authorized the company to sell the entire $5,000,000 of bonds, and it is expected that within the next few months the two bond firms will purchase the remaining $3,000,000 bonds, and this will involve the retirement of the remaining notes. The $4,000,000 notes maturing March 25 will be retired from the proceeds of the sale of the six-per-cent first-preferred stock, of which more than $9,000,000 has been sold, adding to the equity behind the general and refunding bonds. The purpose of the sale of the bonds at this time is to provide for the retirement of the notes maturing December 15, 1915, and thus place the finances of the company on a permanent basis. With the retirement of the one-year notes, the $5,000,000 six-per-cent bonds which are also deposited as collateral will be retired and canceled.

Dividends.

	Term.	Rate.	Payable.
Am. Gas & Elec.	Q	2 %	Apr. 1
Am. Gas & Elec., pf.	Q	1.5 %	Apr. 1
Bangor Ry. & Elec.	Q	1.75%	Apr. 1
Bell Tel. of Can.	Q	2 %	Apr. 15
Buffalo Gen. Elec. Com.	Q	1.5 %	Mar. 31
Consumers Pr., Me., pf.	Q	1.5 %	Apr. 1
Demerara Elec.	Q	1 %	Apr. 1
Elmira W. L. & R. R., 1st pf.	Q	1.75%	Apr. 1
Montreal Tramways	S-A	2.5 %	Apr. 1
New Orleans Ry. & Lt., pf.	Q	1.25%	Apr. 1
New Orleans Ry. & Lt., com.	—	0.5 %	Apr. 1
No. Ohio Trac. & Lt., pf.	Q	1.5 %	Apr. 1
Phila. Trac.	S-A	4 %	Apr. 1
Puget Sound Trac. Lt. & Pr., pf.	Q	$1.50	Apr. 15
Pub. Ser. Corp. of N. J.	Q	1.50%	Mar. 30
Trinidad Elec.	Q	1.75%	Apr. 10
West India Elec.	Q	1.25%	Apr. 1
Western Union	Q	1 %	Apr. 15

Reports of Earnings.

DULUTH-SUPERIOR TRACTION.

The report of the Duluth-Superior Traction Company for the year ended December 31, 1914, compares as follows:

	1914	1913
Gross	$1,313,564	$1,283,914
Net	553,571	535,750
Interest and taxes	243,891	246,062
Surplus	*$309,680	$289,688
Preferred dividends	60,000	60,000
Common dividends	140,000	148,750
Depreciation	100,000	74,101
Surplus	$9,680	$6,836

*After allowing for four per cent on the preferred stock, the balance, $249,680, is equal to 7.13 per cent on $3,500,000 common stock against 6.56 per cent earned on same stock previous year.

GEORGIA RAILWAY & POWER.

Income account for year ended December 31, 1914:

	1914	1913
Gross earnings	$6,341,184	$5,350,995
Operating expenses	3,323,727	2,687,672
Net earnings	3,017,457	2,663,323
Taxes	434,347	436,096
Other income	166,466	103,627
Gross income	2,749,576	2,330,854
*Fixed charges	2,209,206	1,735,988
Surplus	540,370	594,866

*Including rentals, discount, sinking funds and dividends on underlying issues.

CLEVELAND ELECTRIC ILLUMINATING.
(Central States Electric Corp.)

	1915	1914
January gross	$ 417,559	$ 409,468
Net after taxes	222,769	209,910
Bal. after interest amort. & pfd. divs.	187,343	174,306
Surplus after depreciation	145,587	133,359
Twelve months' gross	4,264,034	4,056,268
Net after taxes	2,006,699	1,958,308
Bal. after interest amort. & pfd. divs.	1,580,792	1,546,227
Surplus after depreciation	1,154,390	1,140,772

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
January gross	$ 274,752	$ 272,026
Net after taxes	110,574	100,077
Surplus after charges	71,855	59,721
Twelve months' gross	3,069,024	2,995,411
Net after taxes	1,190,049	1,055,338
Surplus after charges	712,226	564,297
Balance after preferred dividends	427,003	279,174

CUMBERLAND COUNTY POWER & LIGHT.

	1915	1914
January gross	$ 194,212	$ 184,509
Net after taxes	74,071	64,778
Surplus after charges	11,503	1,202
Twelve months' gross	2,523,323	2,366,719
Net after taxes	1,065,894	1,035,720
Surplus after charges	308,043	314,603
Balance after preferred dividends	170,043	176,603

NASHVILLE RAILWAY & LIGHT.

	1915	1914
January gross	$ 184,546	$ 187,831
Net after taxes	77,570	61,977
Surplus after charges	35,552	17,833
Twelve months' gross	2,237,022	2,209,078
Net after taxes	902,169	855,081
Surplus after charges	404,624	383,696
Balance after preferred dividends	279,624	258,696

CHATTANOOGA RAILWAY & LIGHT.

	1915	1914
January gross	$ 81,330	$ 99,233
Net after taxes	21,122	40,881
Deficit after charges	8,227	*13,228
Twelve months' gross	1,067,193	1,208,529
Net after taxes	365,614	491,791
Surplus after charges	24,509	190,456

* Surplus.

PERSONAL MENTION.

MR. JOHN C. KEYS, of Lawton, Okla., president of the Southwestern Cities Electric Company, is spending a few weeks in New York City

MR. C. K. MORRELL, lately superintendent of the lighting department of the Kentucky Traction and Terminal Company, has resigned, it is understood, to go into business in Lexington. He has been succeeded by Washington Reed, of Smithfield, Va.

MR. E. R. DRINKALL, who spent several years in electrical engineering work in the trade school of Portland, Ore., has accepted an engagement with the William H. Dunwoody Industrial Institute of Minneapolis, where he will teach practical electricity. Mr. Drinkall spent some years in Minneapolis prior to his going to Oregon.

GEN. GEORGE H. HARRIES, of H. M. Byllesby & Company, will not leave the Louisville Gas and Electric Company, now or at any definite future time, according to an announcement which has been sent out by Byllesby & Company. General Harries, who was reported in Louisville to have the intention ultimately to resign, is now in Omaha, Neb., directing the Byllesby interests in that city.

MR. W. D. RAY, for five years executive manager of the Northern Indiana Gas and Electric Light Company properties in Hammond, East Chicago, Whiting, and a number of smaller towns in their vicinity, has resigned his position, to become effective on or before May 1. Mr. Ray has accepted the joint management of the Atlantic Gas and Electric properties of the General Gas and Electric Company at Easton, Pa. These properties cover the public utility service in some 15 cities and towns. Hitherto the gas and electric properties have been operated separately, but Mr. Ray will be the executive head of both plants.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 15	Mar. 8
American Tel. & Tel. (New York)	120	120½
Commonwealth Edison (Chicago)	137¼	138
Edison Electric Illuminating (Boston)	242	240
Electric Storage Battery common (Philadelphia)	48¾	48⅝
Electric Storage Battery preferred (Philadelphia)	48¾	48⅝
General Electric (New York)	139½	139
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	7¼	7
Massachusetts Electric preferred Boston)	47	46
National Carbon common (Chicago)	133	135
National Carbon preferred (Chicago)	119½	—
New England Telephone (Boston)	132	—
Philadelphia Electric (Philadelphia)	24	24
Postal Telegraph and Cables common (New York)	72¾	74½
Postal Telegraph and Cables preferred (New York)	65	65
Western Union (New York)	64	63¼
Westinghouse common (New York)	68½	68½
Westinghouse preferred (New York)	116	117

Mr. Ray is one of the leading figures in the central-station industry. His administration of the affairs of the Northern Indiana Gas and Electric Company has developed these properties in a most remarkable way. He will be greatly missed in Hammond and the surrounding cities, as he was one of the most active exponents of community development and took a prominent part in the organization of the Hammond Country Club, the Hammond Chamber of Commerce, and in a number of fraternal organizations with headquarters in that section. Possessed of a great faculty for making friends, his genial disposition will make him readily acceptable wherever his future activities may call him. He is a member of the American Gas Institute, National Electric Light Association, National Commercial Gas Association, vice-president of the Chicago Electric Club and chairman of its finance committee. He has been a member of the American Institute of Electrical Engineers for 22 years; vice-president of the Indiana Electric Light Association and director of the Indiana Gas Association. Besides being a director of the Countrv Club and the Chamber of Commerce he is a director of the Hammond Manufacturers' Association and twice Illustrious Potentate of Orak Temple of Hammond as well as a 32 degree Mason. He is also a member of the Hamilton Club in Chicago, the Indiana Society and the Three Score and Ten Club patterned after the famous Grid Iron Club. His career has been a busy one. He was electrical engineer for the Chicago & Northwestern and Northern Pacific railroads; later a designing electrical engineer for the Standard Electrical Company of Chicago; assistant superintendent of electrical operating at the Chicago World's Fair. In 1894 he was general manager of the Everett (Wash.) street railway. While there he patented an electric arc light. Then he became sales engineer for the Lorain Steel Company with territory from Chicago to Minneapolis, until the Westinghouse interests acquired the company's motor interests. He was next engaged as electrical engineer for the traction properties of the Detroit Construction Company, consisting of two 75-mile roads. After finishing these he superintended the constructing of the Grand Rapids, New Haven and Muskegon third-rail system for the Westinghouse interests. Before he went to Hammond he was contract agent for the Chicago Drainage Canal's hydroelectric plant.

OBITUARY.

MR. WILLIAMS MARMADUKE KAVANAUGH, president of the Little Rock Railway and Electric Company, Little Rock, Ark., died on Sunday, February 21.

MR. ARTHUR EDWIN HAYNES, for 16 years professor of mathematics in the college of engineering of the University of Minnesota died at his home, 703 East River Boulevard, Minneapolis, March 12. Death was due to heart failure from which Professor Haynes suffered for some time. He was a brother of the late Mr. James C. Haynes, who served as mayor of Minneapolis. Professor Haynes went to Minneapolis in 1896 to become professor of mathematics in the university. In 1901 he became professor of mathematics in the College of Engineering, in which position he served until 1912, when he resigned on a Carnegie allowance. Professor Haynes was well known among engineers of the Northwest and was a member of a large number of engineering societies.

DATES AHEAD.

Minnesota Electric Association. Annual meeting, St. Paul, Minn., March 23-25. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

National Association of Electrical Inspectors. Annual convention, Hotel Martinique, New York City, March 23-25. Secretary, W. L. Smith, Concord, Mass.

Electrical Committee, National Fire Protection Association. Annual meeting, 123 William Street, New York City, March 24-25. Secretary, Ralph Sweetland, 141 Milk Street, Boston, Mass.

Mississippi Electric Association. Annual meeting, Hattiesburg, Miss, April 12-14. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Georgia Electrical Contractors' Association. Annual meeting, Atlanta, Ga., April 15. Secretary, T. H. McKinney, Atlanta, Ga.

American Institute of Electrical Engineers. Industrial Power meeting, Pittsburgh, Pa., April 15-16. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

Iowa Section, National Electric Light Association. Annual convention, Keokuk, Iowa, April 20-22. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

American Electrochemical Society. Annual meeting, Hotel Chalfonte, Atlantic City, N. J., April 22-24. Secretary, J. W. Richards, South Bethlehem, Pa.

National Electric Light Association. Annual convention, San Francisco, Cal., June 7-11. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Arkansas Association of Public Utility Operators. Annual meeting, Little Rock, Ark., May 11-13. Secretary, W. J. Tharp, Little Rock.

With the Electrical Manufacturers

The Electrical Alloy Company, Morristown, N. J., announces that the Maydwell Company, Incorporated, 408 Globe Block, Seattle, Wash.; 409 Sheldon Building, San Francisco, Cal.; and 822 Central Building, Los Angeles, Cal., has been appointed its Pacific Coast representative.

The Wesco Supply Company, St. Louis, Mo., will have its new general supply catalog No. 200 and its automobile supply catalog No. 210 ready for the trade about April 1. These publications have been in preparation for some time and will be sent to those interested on request to be put on the company's mailing list.

The Globe Stove & Range Company, Kokomo, Ind., which is just marketing a new line of electric ranges, has opened an office in room 533, First National Bank building, Chicago. This office is in charge of M. E. Louth, manager of the Electrical Department of the Company. Mr. Louth will have on exhibition a full line of Globe electric ranges.

Walpole Tire & Rubber Company, Walpole, Mass., has issued a catalog of its electrical insulating products. Among these a varietiy of insulating tapes and splicing compounds, insulating liquids and compounds, varnishes, shellacs, cements, molded bushings, gaskets, cushions, etc. The characteristics of each of these products is described, as also the process of manufacture in several cases.

The Jefferson Electric Manufacturing Company, 847 West Harrison Street, Chicago, has been organized to manufacture a line of toy and bellringing transformers, ignition apparatus and other electrical specialties. J. C. Daley, electrical and designing engineer for the Thordarson Electric Manufacturing Company, Chicago, has severed his connection with that organization and joined with J. A. Bennan and A. R. Johnson in the incorporation of the new company.

The General Motors Truck Company, Pontiac, Mich., has published a handsome bulletin entitled "Municipal Progress." This illustrates and describes the use of the electrically-driven street-flusher, a large number of such installations having been made by the General Motors Truck Company. Other G-M-C equipments used by police patrol and ambulance departments, electric service wagons, motor busses, repair trucks and large capacity trucks for severe service are also illustrated and described.

The Albert & J. M. Anderson Manufacturing Company, Boston, Mass., has issued bulletin No. 32, describing and illustrating Anderson charging plugs and receptacles. This equipment for charging storage batteries on electric vehicles, trucks and railway cars is the result of 15 years' experience in the manufacture of these parts, and the development stands today as thoroughly trustworthy and serviceable for every demand.

The Meadows Manufacturing Company, Pontiac, Ill., has published a handsome bulletin describing the Meadows family power washer. This

bulletin is so attractively prepared and contains so many excellent suggestions that every electrical contractor, dealer, jobber of electrical supplies and the commercial departments of central stations should be interested in securing a copy, which the company will be pleased to furnish on request.

Hygrade Incandescent Lamp Company, Danvers, Mass., is making attractive price offers to jobbers and dealers of its tungsten and carbon lamps. This independent company has been in business about four years, during which the volume of sales has been rapidly increasing; at the present time the company is making over five times as many lamps as it did a year ago. Plans are under way for tripling the present manufacturing capacity in the near future.

The Post-Glover Electric Company, 314 West Fourth Street, Cincinnati, Ohio, has sent out circulars on the Niagara metal-case flashlights which it is handling for the Niagara Searchlight Company, Incorporated, Niagara Falls, N. Y. Eleven types of these battery-operated searchlights are listed. Included among these are pocket tubular-type lamps, inspection lamps for use particularly around automobiles, motor searchlights, both of the hand and cap type, bicycle headlights and the Niagara bandman's cap light.

The Blaisdell Machinery Company, Bradford, Pa., has issued a new general catalog of its compressors and vacuum cleaner systems. This is an attractively prepared and valuable book with a large number of fine illustrations and much useful information and data on the use of compressed air. A large variety of compressor equipments are described, and vacuum cleaner outfits of the stationary type. Most of these are electrically driven. There are numerous views showing the utility of vacuum cleaner appliances and views of typical fine buildings in which such equipment is installed.

Cambria Steel Ccompany, Johnstown, Pa., has issued a catalog on slick mine ties. These are rolled-steel cross ties for mine and industrial railways. They are light in weight, but of sufficient strength; their most striking feature is that they are but one-half inch thick, thus giving several inches greater headroom in shallow mines, tunnels, under bridges, etc. Rails are quickly secured to the ties by means of flanged buttons, always in place and ready for use. The construction and advantages of these ties are set forth in the new catalog. Dimension diagrams and tables are given, also data on rails and bonds for such railways.

National Metal Molding Company, Pittsburgh, Pa., has ready for distribution bulletin No. 250, which is a catalog on the company's outlet boxes and covers. This line of fittings includes many new boxes and covers and is now complete. The catalog has several novel and distinctive features. A fine line cut of each box and cover is placed on the left margins of the left-hand pages to facilitate locating any type. Short descriptions of the boxes and covers and their uses are given on the right-hand pages facing the corresponding cuts. Boxes of the same type with different sizes of knockouts are given different numbers, so that in placing orders, it is necessary merely to give the catalog number and whether the finish is to be enameled or sherardized. Fully ten pages are given to a convenient index, numerically, and alphabetically arranged and also giving numbers of boxes and covers of other manufacturers and the corresponding catalog numbers of National boxes and covers and where reference to the latter can be quickly found. Copies of this catalog will be sent to all interested on request to the company.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued in pamphlet form a reprint of a paper entitled "Some Electrical Problems Practically Considered," which was presented before the last convention of the Association of Iron and Steel Electrical Engineers by B. G. Lamme, chief engineer of the Westinghouse company. The paper covers, in an exceedingly interesting and non-mathematical style, many of the practical problems met with in the operation of electrical machinery, particularly the subjects of insulation, commutation, speed control, and choice of frequency. The company will send a copy, as long as the supply lasts, to anyone interested. In leaflet No. 3482-A, also recently issued by the company, wheel lathe equipments are described and illustrated; the class of work performed by these equipments is of special nature owing to the fact that hard spots are frequently encountered, and unless cut at low speeds the tool is apt to break; such conditions call for an efficient control system which is supplied in these equipments. "Pole Line Hardware" is the title of catalog section No. DS846 issued by the company; this gives a complete list of the different accessories used in connection with transmission lines together with illustrations of same.

Record of Electrical Patents.

Issued by the United States Patent Office, March 9, 1915.

1,130,697. Automatic Telephone-Exchange System for Subscribers' Lines with Extension Sets. F. Aldendorff, assignor to Western Electric Co. Control of special selector releasing circuit can be transferred from private-branch switchboard to extension stations.

1,130,706. Railway Signal System. R. H. Bryant, Little Rock, Ark. Passage of trolley wheel on single-track road electromagnetically controls the signals.

1,130,708. Skelp-Charging Apparatus. S. C. Coey, assignor to Youngstown Sheet & Tube Co., Youngstown, O. Has electromagnetic charging roller.

1,130,710. Electric Battery. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. Has resilient helically coiled terminals.

1,130,729. Electrical Ignition System for Internal-Combustion Engines. O. Heins and C. M. Wild, assignors to Bosch Magneto Co., New York, N. Y. Has a service magneto and an auxiliary magneto.

1,130,734. Electric Furnace. W. S. Horry, assignor to Union Carbide Co., New York, N. Y. Has several sets of delta-connected three-phase electrodes.

1,130,755. Electric Generator. J. L. Milton, Anderson, Ind. Ignition magneto with timer.

1,130,775. Wire Finding and Coupling Device. O. J. H. Toffey, Waterbury, Conn. For fishing wires in conduit.

1,130,784. Measured-Service Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Partly automatic system.

1,130,808. Battery Well. J. M. Fitz Gerald, assignor to Railroad Supply Co., Chicago, Ill. Knockdown well for signal batteries.

1,130,814. Starter Attachment for Motor Vehicles. F. M. Guy, assignor to Disco Electric Starter Co., Detroit, Mich. Relates to mounting of starting motor.

1,130,827. Apparatus for Generating Ozone. W. J. Knox, New York, N. Y., assignor to Knox Terpezone Co. of America. Consists of a double-walled cylindrical glass vessel and a body of mercury within the annular space acting as one electrode.

1,130,860. Cord-Adjuster for Electric Drop Lights. G. E. Thorberg, Mandan, N. D. U-shaped spring clip with double hook for the supporting strings.

1,130,899. Heat-Regulator for Incubators. C. P. Heimbourger, Beardstown, Ill. Thermostatic control for electric heating circuit.

1,130,901. Telegraph Apparatus. C. Henry, Edgemont, Ark. Tape-marking device associated with sounder.

1,130,904. Bearing for Electromagnetic Sparking Machines. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Insulated from frame of engine.

1,130,916. Electric Bath-Cabinet. H. C. Marrinan and J. Gorman, St. Paul, Minn. Combination bath and electric heating cabinet.

1,130,934. Internal-Combustion Engine. J. F. Sandell, Chicago, Ill. The charge of liquid fuel is electrically vaporized.

1,130,935. Connector-Plug for Electrical Instruments. F. E. Shailor, assignor to F. Kuhn, Detroit, Mich. For heating appliance.

1,130,941. Process for Producing Reactions in Gases and Apparatus for Practicing the Same. L. L. Summers, Chicago, Ill. Consists in feeding the component gases separately to an electric arc and then extinguishing the arc.

1,130,949. Rheostat. H. J. Wiegand, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Peripheral band clamped around circular base and provided with flanges and supporting lugs.

1,130,969. Circuit-Controller. A. H. Fleet, assignor to Cutler-Hammer Mfg. Co. Push and pull switches for throwing automobile headlights in series or parallel.

1,130,971. Intercommunicating Telephone. W. W. Henry, assignor to S. H. Couch Co., Atlantic, Mass. Compact wall instrument.

1,130,976. Rheostat. A. J. Horton, assignor to Cutler-Hammer Mfg. Co. Resistance wound transversely about base with taps for the contacts.

1,130,977. Safety Device. M. R. Hutchison, assignor to Edison Storage Battery Co., West Orange, N. J. Explosionproof gas vent for storage cell.

1,130,985. Thermostatic Electric Switch. F. Kuhn, Detroit, Mich. For automatic control of electric heater.

1,130,986. Air-Heater. F. Kuhn. Electric heater with top grating and supergrating.

1,130,987. Electrical Heater. F. Kuhn. Has sheet-metal framework.

1,130,994. Push-Button or Circuit-Closer. L. C. F. Metzger, St. Louis, Mo. Spring wire contacts.

1,131,006. Electric Signal System. E. A. Reynolds and H. V. Reynolds, Anderson, Ind. Controlled through track rails and parallel conductors.

1,131,037. Method of Making Bands from Sheet Metal. S. C. Cary, assignor to Cary Mfg. Co., Brooklyn, N. Y. Consists in electrically welding the sheets at their adjacent edges to produce flush seams.

1,131,059. Support for Electric Fixtures. C. H. Groffman, Syracuse, N. Y. Cross bar secured to joists supports insulating knobs, fixture stem and canopy.

1,131,060. Electric Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Electric radiator.

1,131,063. Portable Magneto-Electric Machine. C. Klemmer, Bisbee, Ariz. Adapted to be held in the hand and manually operated.

1,131,067. Process of Treating Liquid. C. P. Landreth, Philadelphia, Pa. Suspended matter is precipitated by passing electric current through the liquid.

1,131 079. Incandescent Lamp. C. E. Pierce, Cambridge, Mass. Non-renewable lamp with tubular prolongation from end of filament support reaching to and covering inside of tip.

1,131,093. Switch Plate. H. T. Sperry, assignor to Waterbury Mfg. Co., Waterbury, Conn. Face plate with upset screw holes and reinforced hinge for door over central opening.

1,131,098. Line-Testing Switch. J. M.

Watkins, Buffalo, N. Y. Permits cutting the main circuit into parts and short-circuiting each part to permit testing each separately.

1,131,115. Sparking Plug. R. Carpentier, assignor to Société Carpentier, Ral & Cie., St.-Denis, France. Provides for spontaneous unsooting of the electrodes.

1,131,129. Switching Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Push-button type pendent switch. (See cut.)

1,131,133. Automatic Warning System for Electric Railways. E. R. Hill, East Orange, N. J. Electric visual and audible alarm to warn approach of low bridges.

1,131,140. Automatic Switch for Telephone Systems. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Switch arm oscillates from central pivot in both vertical and horizontal planes.

1,131,151. Apparatus for Stage Illusions. L. McCormick, London, England. Representation of a tree trunk includes electric lamps in the trunk.

1,131,154. Separable Spark Plug. A. R. Mosier, assignor to A. R. Mosier & Co., New York, N. Y. Details.

1,131,168. Electric Signaling Apparatus for Ships' Telegraphs and Like Purposes. H. L. Stocks, Kirkcaldy, Scotland. Electric bell sounds when pointer is moved.

1,131,174. Electrical System of Distribution. W. A. Turbayne, assignor to Central Trust Co. of New York. Auxiliary exciting field coils connected to storage battery to insure proper polarity and rapid building up of field regardless of direction of generator rotation.

1,131,175. System of Electrical Regulation. W. A. Turbayne, assignor to Central Trust Co. of New York. Storage battery connected across D. C. mains through booster that is regulated by current in A. C. mains.

1,131,176. Automatic Regulator. W. A. Turbayne, assignor to Central Trust Co. of New York. Axle-driven car-lighting generator is regulated to produce constant current.

1,131,187. Self-Inductive Means for Electrical Oscillatory Circuits. G. von Arco, Berlin, Germany, and R. H. Rendahl, Lilienholn, Sweden. High-tension variometer with a number of fixed coils and movable coils alternately arranged.

No. 1,131,129.—Pendent Switch.

1,131,189. Joining Lamp-Filaments to Current-Supply Wires. E. Weintraub, assignor to General Electric Co. Consists in using boron to render the wire fusible so as to adhere to the carbon filament.

1,131,190. Production of High-Frequency Currents. E. Weintraub, assignor to General Electric Co. Includes electric fan, mercury-arc rectifier, a capacity circuit and antenna.

1,131,200. Support for Dynamo-Electric Machines. W. L. Bliss, assignor to Central Trust Co. of New York. For axle-driven car-lighting generator.

1,131,202. Electric Indicating System. J. H. Boyden, Glenn Dale, Md. Includes transmitter and remotely located indicating receiver.

1,131,211. Rural-Mail-Delivery Signaling Apparatus. C. F. Collier, Lakeville, O., assignor of one-half to J. C. Lake. Electric alarm.

1,131,216. Transmission Line. E. E. F. Creighton, assignor to General Electric Co. Has impedances unsymmetrically distributed at comparatively long intervals.

1,131,218. Electrically Controlled Brake Mechanism. E. H. Dewson and W. V. Turner, assignors to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically controlled valve for air brake.

1,131,219. Electropneumatic Vent-Valve Device. E. H. Dewson and W. V. Turner, assignors to Westinghouse Air Brake Co. Modification of above.

1,131,234. Ray Tube. E. H. Grubbé, Chicago, Ill. Has angle-forming tube passing close to anode for cooling it.

1,131,237. System of Distribution. L. A. Hawkins, assignor to General Electric Co. Metal-walled mercury rectifier for supplying D. C. to locomotive from single-phase trolley has means for heating the anodes while no current is taken by motors.

1,131,244. Time Indicator. W. M. Jeffreys and W. H. Creahen, Youngstown, O., assignors of one-half to H. W. Kerr and D. T. Murray. Electric stop watch or clock.

1,131,246. Illuminated Cash Register Indicator. C. F. Kettering and W. A. Chryst, assignors to National Cash Register Co., Dayton, O. Electric lamp for attracting attention to the indicator.

1,131,249. Retaining-Ring for Dynamo-Electric Machines. E. R. Knight, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. For holding the rotor laminations in place.

1,131,250. Telephone Reinforcing Circuit. C. D. Lanning, Boston, Mass. Series-connected repeater.

1,131,251. Means for Controlling Direct Currents. C. D. Lanning. Electromagnetic means for intensifying the undulations of a varying direct current.

1,131,258. Transformer. L. C. Nichols, assignor to Allis-Chalmers Mfg. Co. Shell has external pipes to permit circulating and cooling the oil.

1,131,265. Method of and Apparatus for the Matching of Colors. M. R. Pevear, Boston, Mass. Comprises electrically producing light of known color and a series of devices graded as to capacity to absorb color.

1,131,277. Flat Iron. R. P. Shannon, assignor to C. R. Barrett, Chicago, Ill. Handle and heel construction for electric iron.

1,131,278. Automatic Supervision of Service in Hotels and the Like. H. W. Skinner, Maywood, Ill. Locking and unlocking of door is electrically recorded.

1,131,282. Constant-Current Rectifier System. C. P. Steinmetz, assignor to General Electric Co. Mercury-arc rectifier normally fed from constant-current transformer can have auxiliary electrodes energized from constant-potential source.

1,131,292. Vapor Converter and Circuits Therefor. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Inductance in series with cathode and a shunt from auxiliary anode to further side of inductance.

1,131,297. Indication Circuit for Railway-Traffic-Controlling Devices. P. Utne, assignor to Union Switch & Signal Co., Swissvale, Pa. Electric signals for crossover switches.

1,131,311. Process of Wire-Tying Bags. A. M. Bates, assignor to Bates Valve Bag Co., Chicago, Ill. The wire ends are electrically welded together.

1,131,316. Electrical System of Distribution. J. Bijur, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Generator regulator for axle car-lighting system.

1,131,389. Combined Drop and Jack. W. Leaver, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. For magneto telephone switchboard.

1,131,399. Outlet Box. J. B. McGinley, assignor to Handy Mfg. Co., Pittsburgh, Pa. Openings have notches and wedge-like edges on which shoulders on the closing plates are wedged by turning. (See cut.)

1,131,402. Electric System for Vehicles. R. H. Manson, assignor to Garford Mfg. Co., Elyria, O. Interconnected control of spark circuit and circuit for starting motor.

1,131,405. Electrical Protector for Automobiles and Similar Vehicles. G. A. Merrill, New York, N. Y. Alarm circuit closed by tampering or removal of any portable article.

1,131,428. Lamp. L. Schepmoes, assignor to Safety Car Heating & Lighting Co. Inclosed car-lighting fixture with reflecting shade and diffusing globe.

1,131,434. Electrical Regulation. W. Snee and J. A. Snee, Jr., West Elizabeth, Pa. Consists in charging a storage battery from generator driven by wind wheel and governing the voltage by the joint action of the state of battery charge and of the wind.

1,131,435. Utilizing Variable Power. W. Snee and J. A. Snee, Jr. Amplification of voltage regulation of above.

1,131,439. Telephone Recorder. E. R. Talley and R. P. Norton, Algona, Iowa. Phonograph attachment for recording the message.

1,131,447. Telegraph Repeater. F. E. Wallace, Franklin, Cal. Has angularly disposed lever contacts.

1,131,454. Sound-Reproducing Machine. W. C. Wolfe, Lilly, Pa. Motor for winding the spring of phonograph.

1,131,455. Telephone System. H. M. Wright, Darlington, Okla. Includes electrically operated switch for subscribers' stations.

1,131,466. Driving Mechanism. P. T. Coffield and J. Bremer, assignors to Maytag Co., Newton, Iowa. For electric washer.

1,131,469. Wiring System. J. A. Cole, New York, N. Y. Switching system for lamp circuits.

1,131,484 and 1,131,485. Auxiliary Actuating Device for the Brake Mechanism of an Automobile. E. A. Dieterich, New York, N. Y. Electrically controlled release for the brake can be operated in emergency by passenger in rear seat.

1,131,498. Indicator or Timer. R. C. Emery, Newton, Mass. For avoiding recurrent disturbances of operation in radiotelegraphy.

1,131,536. Train-Stopping System. A. Mainardi, S. Mainardi, and H. Mainardi, Paterson, N. J., assignors of one-fifth to J. Mainardi and one-fifth to V. Mainardi. Electrically controlled through conductors along the trackway.

1,131,541. Electric-Lamp Socket. A. H. Nero, assignor to Arrow Electric Co., Hartford, Conn. Locking socket.

1,131,551. Dynamo-Electric Machine. A. A. Price, London, England. Spiral groove on armature shaft permits axial movement of armature and brush-holder on reversal of rotation.

1,131,556. Spark-Plug Attachment. E. Rolle, Frontenac, Kans. Hollow cap to protect electrodes.

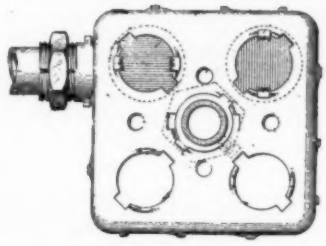
1,131,598. Telephone Apparatus. W. M. Byrnes, Vail, Iowa. Hook switch.

1,131,606. Anode for Discharge Tubes. T. H. Gebauer, Cleveland, O.; C. L. Gebauer, administrator of said T. H. Gebauer, deceased, assignor of one-third to C. F. W. Bates. Comprises a body of heat-diffusing metal having a smaller body of heat-resisting metal cast in it, the face of the former being cut away to expose a portion of the smaller body to the cathode stream.

1,131,609. Process of Cooling Electric Furnaces by Air. H. Magron, Fos, Haute-Garonne, France. Consists in circulating previously cooled air about the walls.

1,131,614. Electric Motor. A. A. Radtke, Chicago, Ill., assignor to Electric Time Recorder Co. Has three successively energized electromagnet coils (120 degrees apart) with reciprocating plungers acting through connecting rods on a common shaft.

1,131,624. Telephone Apparatus. J. Erickson, assignor to First Trust & Savings Bank, Chicago, Ill. Subscriber's switch hook.



No. 1,131,399.—Outlet Box.

1,131,635. Diaphragm Horn. M. R. Hutchison, West Orange, N. J., assignor to Lovell-McConnell Mfg. Co. Motor-driven cam vibrates diaphragm.

1,131,637. Speed-Controlling Mechanism for Vehicles. F. T. Jones, assignor to American Train Control Co. Electric signal and safety controlling system for railways.

Reissue 13,890. Manual-Call-Distributing System. J. H. Levis, Jr., assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Original No. 1,100,749, dated June 23, 1914. For distributing calls uniformly among all the operators in service.

Patents Expired.

The following United States electrical patents expired on March 15, 1915:

600,509. Controller for Electrically Propelled Vehicles. R. T. D. Brougham and W. C. Bersey, London, England.

600,523. Quick-Break Electric Switch. T. E. Drohan, Chicago, Ill.

600,527. Depressible-Rail System for Electric Railways. W. Grunow, Jr., Bridgeport, Conn.

600,607. Insulator Support for Electrical Conductors. F. Benedict, Niles, Mich.

600,616. Alternating-Current Meter. G. Hummel, Munich, Germany.

600,633. Trolley. J. Clayton, Cuyahoga Falls, O.

600,693. Method of Making Soluble Metal Electrodes for Accumulators. J. Julien, Brussels, Belgium.

600,719. Galvanic Battery. E. Habermann, Michigaan City, Ind.

600,743. Automatic Safety Circuit-Closer and Cutout. W. L. Pratt, Adams, N. Y.

600,765. Automatic Fire Alarm. R. J. Baker, Baltimore, Md.

600,850. Primary Battery. J. E. Fuller, New York, N. Y.